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Newsletter Hawaiian Botanical Society

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by Donald P. Gowing

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NOTE ON THE USE OF THE INDEX

In Part 1, scientific names are given (*in italics*) when the taxon is the principal subject, but the index to plant genera in Part 2 includes all references where the scientific name is given.

Both parts of the index include references within the text of the articles as well as keywords from titles.

Alternative generic names still in occasional use are given in [Brackets], but misspellings are given in both brackets and ["Quotes"], thus.

Contributors' names are in caps, as "ABBOTT,I.A.", but other references to individuals (as the subject or as speaker, officer, etc.) are shown as "Abbott,I.A."

Volume numbers are in boldface (**26**); multiple entries in one volume are paged sequentially without repeating the volume number. The symbol "ff" indicates contributions in the same issue on successive pages by the same author or on the same topic, or "ff" may also indicate more than two references to the same taxon in the same article.

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Wedelia--**26**:62
Wikstroemia--**26**:31,53,54; **27**:80
Wilkesia--**26**:44; **29**:46,47; **30**:40
Wisteria--**26**:42
Woodsia--**27**:32
Xanthium--**27**:89ff; **28**:63
Xenostele--**28**:8,52,53
Xiphosteris--**29**:36
Xylosma--**29**:47; **30**:40
Zanthoxylum--**27**:78; **28**:7,52,59; **29**:28,49; **30**:41
Zinnia [“Zinia”]--**27**:34

NEWSLETTER OF THE HAWAIIAN BOTANICAL SOCIETY
C/O DEPARTMENT OF BOTANY
UNIVERSITY OF HAWAII AT MANOA
3190 MAILE WAY
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Newsletter
Hawaiian Botanical Society

VOLUME 30 (1)

MARCH 1991
(publication date March 1992)

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Published by the Hawaiian Botanical Society, which was founded in 1924 to "advance the science of botany in all its applications, encourage research in botany in all its phases, promote the welfare of its members and develop the spirit of good fellowship and cooperation among them." Any person interested in the plant life of the Hawaiian Islands is eligible for membership. Information may be obtained from the Society, c/o Department of Botany, 3190 Maile Way, University of Hawaii, Honolulu, Hawaii 96822.

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Executive Council

President: Heidi Bornhorst (The Nature Conservancy)
Vice-President: Timothy Motley (UH Botany Department)
Treasurer: George Staples (Bishop Museum Botany Department)
Secretary: Benton Pang (UH Botany Department)
Directors: Isabella Abbott, (UH Botany Department)
Leilani Pyle (Bishop Museum Botany Department)

Committees (appointed by the Excecutive Council)

Membership: Donald P. Gowing (Bishop Museum) Chair

Newsletter: Clifford Smith (University of Hawai'i) Editor: assisted by Fiona M. Norris (Bishop Museum Botany Department)

Conservation: Steve Montgomery, (University of Hawai'i)

Science Fair: Rylan N.S. Yee (Data House)

Native Plants: Clifford Smith, Chair
Ken Nagata, Lyon Arboretum
Evangeline Funk, University of Hawai'i
John Obata, Bishop Museum
Art Medeiros, Haleakala National Park

* * *

MEMBERSHIP

The Society year is from December 1 through November 30
Regular Membership is $7.50 per year
Student Membership is $4.00
Family Membership is $10.00 and
Life Membership (individuals only) is $150.00
Life and Honorary Members pay no further dues.

HAROLD ST. JOHN DIES AT AGE 99

Dr. Harold St. John passed away peacefully at his home in Honolulu on Thursday, 12 December 1991. He will always be remembered as a tireless worker and affable teacher of several generations of botany students.

Born 25 July 1892 in Pittsburgh, Pennsylvania, he was the son of a Unitarian minister. He received degrees from Harvard University, completing his doctorate in 1917. During World War 1, he saw combat duty in France as an officer in the U.S. Army. Afterwards, he began a lifetime career of world travel to teach botany, collect plant specimens, do research, and publish his botanical books and papers. He spoke five languages and wrote and worked in seven.

From 1920 to 1929, he taught at the State College of Washington in Pullman. He moved to Hawai'i in 1929, where he taught botany at the University from 1929 to 1958, serving as departmental chairman for many years. In 1971, he was honored by the University when the Plant Sciences Building was named for him.

Dr. St. John's other accomplishments were numerous and varied. He aided in the transfer of Foster Gardens to the City of Honolulu. He taught at Yale as an exchange professor in 1938-1939. From 1953 to 1958, he served as associate director and then director of the Lyon Arboretum in Honolulu. During World War 11, he searched for quinine in the mountains of Columbia for the U.S. Foreign Economic Administration. For the Atomic Energy Commission, he did studies on radiation effects on vegetables. After he retired from the University of Hawai'i, Dr. St. John taught at Chatham College and then, from 1959 to 1961, as a Fullbright professor at the University of Saigon and the College of Hue in Vietnam and at Cairo University, Egypt. He received professional awards from the American Association of Botanical Gardens and Arboreta, Garden Club of America, Hawaiian Botanical Society and Pacific Tropical Botanical Garden.

From 1929 to 1991, he was also a research associate at Bishop Museum. He was a fixture at the Herbarium Pacificum throughout these years, and he essentially moved over to the Museum lock, stock and barrel after he retired from the University. The Museum provided a place to work and unrestricted access to the collections upon which he based his numerous publications, He was an active participant in Museum functions and regularly worked eight to ten hours a day, six days a week up until the fall of 1990 when failing health forced him to slow his pace.

With his wife, Betty, he had a happy family life. They raised four children, many of whom accompanied him on field trips, Friends will remember Dr. St. John as a man always ready to "talk story" and tell wonderful anecdotes about his life and the people he knew.

He is survived by his four chldren, 11 grandchildren, and five great-grandchildren.

Reprinted, with permision, from the Herbarium Pacific Newletter. Vol. 9(1).

Members of the Hawaiian Botanical Society will remember, with affection, Dr Harold St. John's enthusiastic support of the Society. He and his wife Betty were regular attendants at the monthly meetings and his fund of information was freely shared in the open discussions and in his popular lectures on the History of Botanical Collecting in the Islands. In 1979, the Society unanimously accepted the proposal that Dr. St. John be awarded the rank of President Emeritus of the Society, the first to be so honored. Dr St John requested that his collections and the valuable field notebooks remain at the Herbarium Pacificum and that his library be placed in the Botany Department at the University of Hawai‘i, in the St. John Building.

His memorial service was attended by many former students, a fitting tribute to one who devoted his life to sharing his enthusiasm for plants with friends, family and students of all ages.

THE AUSTRALIAN TREE FERN CULTIVATED IN HAWAII

Kenneth A. Wilson
Biology Department
California State University, Northridge
Northridge, CA, 91330

Plant nurseries in Hawaii have increasingly been stocking and selling the Australian Tree Fern. In fact, the Australian Tree Fern is now the most readily available tree fern in the Hawaiian commercial markets. It is favored because it is easily propagated from spores and is a rapid grower, much more so than the Hawaiian tree ferns, often reaching a height of 5 feet in 6 or 7 years. Under optimal conditions it will grow as much as 10 to 12 inches in a year, ultimately reaching about 20 feet. It is also more tolerant of sunnier and slightly drier conditions than are the Hawaiian tree ferns.

The Australian Tree Fern has been misidentified as *Cyathea australis* (also *Alsophila australis*) (Neal 1965) and is usually sold under that name. This confusion exists also in the California markets where this fern is very popular in cultivation and whence much of the commercial stock originates. The correct scientific name for the Australian Tree Fern in cultivation in Hawaii is *Cyathea cooperi* (Hooker ex F. von Mueller) Domin [Synonyms: *Alsophila cooperi* Hooker ex F. von Mueller, *Sphaeropteris cooperi* (Hooker ex F. von Mueller) Tryon]. In Australia, where it is native, it is known as Scaly Tree Fern or Cooper's Tree Fern.

The true *Cyathea australis* (R. Brown) Domin is rarely cultivated in the Hawaiian Islands. it can only be found growing in botanical gardens and in a few private collections. Known as Rough Tree Fern in Australia, it is native to the eastern coasts and mountains of Australia and is common from southeastern Queensland south to New South Wales, Victoria, and Tasmania. *Cyathea cooperi* , on the other hand, is distributed from northeastern Queensland to southeastern

New South Wales, and is the most common tree fern in the native forests of northeastern Queensland (Andrews 1990).

Cyathea australis may be distinguished from *Cyathea cooperi* by having hard leaf bases which persist and cover the trunk almost to the very base and also by the nature of the scales found on the coiled young leaves as well as the bases of the expanded leaves. In *Cyathea australis* the scales are 0.75 - 2 (2-5 cm) inches long, shiny, brown, and all of one kind. *C. cooperi* has two kinds of scales, one 0.75 - 2 (2-5 cm) inches long, whitish and papery, the other 0.5-1.25 (0.5-1.5 cm) inches long, reddish-brown, narrow scales. In the Australian Tree Fern both kinds of scales usually bear minute spines which can be irritating to the skin, although these are easily washed off. The old leaf bases of *C. cooperi* hang onto the trunk for a while, but in time they fall off and leave conspicuous smooth, oval scars on the trunk. Tall specimens of the Australian Tree Fern have a trunk patterned by these leaf scars on the lower portion.

The presence of scale on the leaf bases makes it easy to distinguish the Australia Tree Fern from the native Hawaiian tree ferns of genus Cibotium , which instead bear golden or reddish brown hairs, known to the Hawaiians as pulu. Also the fertile leaves of Cyathea bear uncovered round sori on the lower surface of the leaf segments while those of the Hawaiian tree ferns have marginal two-valved sori which resemble minute purses.

LITERATURE CITED

Neal, M. C. 1965. In Gardens of Hawaii. 2nd ed. Bernice P. Bishop Museum Special Publication 50: 1-924.

Andrews, S. B. 1990. Ferns of Queensland. Queensland Dep. Primary Industries, Brisbane. 1-427.

GOUANIA VITIFOLIA- REDISCOVERED!

A personal account by John Obata.

In the early winter of 1990, Joel Lau rediscovered the long lost *Gouania vitifolia* Rhamnaceae). The species had only been collected once this century- by the late Otto Degener and friends- from Ke'eau Valley, Wai'anae on Oahu. No plants were seen later than this 1932 collection despite an exhaustive search by Steve Perlman and myself throughout the Ke'eau Valley in 1988. Cattle had ravaged the only known site and the plant was presumed extinct. In 1990, however, Joel Lau ran into this viny species towards evening one collecting trip and had to beat a hasty exit from the hills before darkness set in. Only a twig bearing leaves and tendrils was his evidence that time.

On December 16, 1990, Joel and I went to check on the two species of Gouania known from Oahu in this sub-gulch in Wai'anae Kai (the other being *G. meyenii*). Arriving at the "colony," we found the vines festooned with flowers. The area occupied was about 20-30 m and the species seemed to compete successfully with 5 or 6 vines of the aliens Ipomoea and Passiflora, as well as the native Strongolodon. At the time we thought that the colony consisted of several vines, but, at later date, more careful observation among the mass of tangled vines revealed that they all originated from one single stalk measuring about 7.5 cm in diameter. The vines do resemble the grape vine as the specific name implies. The mature stems are light brown with distinct creamy striations and produce short annual lateral stems which bear the inflorescences. Mature stems also bear terminal inflorescences.

At the end of March, we made an attempt to collect seeds, but found that none of the thousands of flowers seen in previous visits had born any fruit. In the winter of 1991 hand pollination was attempted. Casual field observarions showed that the flowers were staminate. A more careful examination later revealed a somewhat functional pistillate structure, and staminodes. Hence the lack of fruits!!

Cuttings in stem culture and tissue culture have not, as yet, met with any success- a grim reminder of the plight of a species on the verge of extinction.

John Obata.

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HAWAIIAN BOTANICAL SOCIETY
Minutes of the Meeting of November, 1990

Donald Gowing opened the meeting at 7:35 p.m.

New Guests.
Terri and Michael Kristiansen, Lyn Kerry, Karin Jacobsen, Ann and Brad Waters, Randy Walker, Tanya Lee, Peter Galloway, Scot Medbury.

Minutes.
Minutes of the meeting of the October meeting were read and accepted.

Treasurer's report.
No report.

Membership committee
No new members.

Nominating committee:

The nominating committee proposed the following slate to be voted upon in December:

President: Heidi Bornhorst
Vice President: Timothy Motley
Secretary.: Benton K. Pang
Treasurer: George Staples
Directors: Isabella Abbott, Leilani Pyle

Old business:

i. The British Museum agreed to subscribe to our newsletter

ii. Eight people attended the visit to Makapu'u. The Society will draft a letter to the city and parks director to set aside this area as a lowland botanical garden.

New Business:

The secretary announced that a new Native Plant Society would meet at 7 pm on December 7 in the Manoa Library.

Scientific Program:

Plant of the month speaker was Kanehiro Kitayama from the Botany Department. His talk focused on the native plants found on the island of Anijima in the Bonin Islands. This never before populated island is home to a host of island endemics (73% of the trees and 10 species of land snails). It is a dry oceanic subtropical island, about 1/3 the size of Kaho'olawe, with primary vegetation. The Tokyo Metropolitan Government plans to build a runway in 1993 that would have major effects on the endemic plant community. Kanehiro asked the Society to write a letter to the Tokyo Metropolitan Government to reconsider their plans for the runway.

Michael Kristiansen, the director of the Honolulu Botanical Gardens, was the speaker of the month. He outlined the concepts and projects of the Honolulu Botanic Gardens, and invited input from the Society as to any particular interests they would like to see employed. After describing the Gardens (Foster, Ho'omaluhia, Koko Crater, Wahiawa) he described the function of each garden: management and maintenmaintenance, horticultural, interpretive, and recreational. He also talked about a garden at Mauna Lahilah dedicated to plants intro-introduced by the Polynesians, and plans for a garden to be called the garden called the Lili'uokalani Garden in Honolulu. At the end of the talk the members gave their support to efforts of the gardens and talked about areas where native Hawaiian plants, both dryland and forest species, could be planted.

****

HAWAIIAN BOTANICAL SOCIETY

Minutes of the Annual Meeting of December 1990

Donald Gowing opened the meeting at 7:35 p.m.

New Guests.
Daniel Chang and Charlie Kupa.

Minutes.
Minutes of the November Meeting were read and accepted.

Treasurer's report.
The treasurer's report for the months of October and November was read and accepted

Membership committee.
The committee announced the passing of Dr. Sanford Seigel, Chairman of the Botany Department, at the University of Hawai'i and a devoted member of the Society

Mailing list was noted as follows:

165	total members
25	life
9	honorary
90	regular
14	students
15	family

12 institutional
press run: 200 newsletters, and 150 meeting notices

Announcements.
Lyndon Wester announced a talk to be given in the Geography department by Dan Taylor on resource management and park policy. He also announced a weed-pulling party at Koko Head on Saturday December 8.

Secretary Pang announced that the Hawaiian Botanical Society had been asked by Paradise Park to icreate a display about the Society in their new Conservation Room. He moved that: "the Society accept the terms given by Paradise Park to increase the public awareness of the Hawaiian Botanical Society and their endeavors."

Motion Carried.

Old Business.
i. A letter written by Dr Wester to the director of Parks and Recreation asking for a botanical garden near MakaPu'u was read by Dr. Abbott. Dr. Gowing encouraged discussion of the letter because the board was not unanimous in their decision to send the letter.

After discussion for and against the letter, it was moved that the action be tabled for the new administration next year to set up a committee and report back to the Society on the findings.

ii. Secretary Pang moved that the Society write to the Tokyo Metropolitan Government for alternate plans of an airport in one of the Bonin Islands; a talk that Kanehiro Kitayama gave last month. The motion was unanimously moved and seconded to be referred to the executive committee and signed by next year's president.

New Business:
The Annual report for the year 1990 was read by Secretary Pang .

Treasurer's annual report was not yet ready but would be prepared.

Election of Officers.
Treasurer Staples notified the members that there would be a vacancy on the executive committee as the President, who would normally fill the position, had resigned earlier and the Vice President could not make the meetings for the 1991 year. It was moved that a new nomination be presented by the next administration for membership approval as no one present at the meeting offered to take the position.

President: Heidi Bornhorst
Vice President: Timothy Motley
Secretary: Benton K. Pang
Treasurer: George Staples
Executive Directors: Isabella Abbott, Leilani Pyle

It was moved and seconded that the slate listed become the 1991 administration for the Hawaiian Botanical Society.

Motion carried.

Scientific Program:
Vice President, Don Drake, introduced the "Plant of the Month" speaker Ron Fenstenmacher, collections officer for the Ka Papa Lo'i o Kanewai. Ron gave a brief history of the taro lo'i and its beginnings when he was a student at the university. It consists of wet and dry areas primarily for Polynesian introduced plants, and endemic Hawaiian plants. He showed slides of some of the natives that are planted in the dry area of the lo'i. The reasons for planting the plants are 1) for the integrity of the plants themselves, 2) to give the plants a place of refuge, and 3) for people and education.

His main interest, as was evident from the slides, was to illustrate that these unique dryland plants could survive in this area naturally. He encouraged the Society to come visit the taro lo'i off of Dole Street and a field trip was planned for February.

Vice President Don Drake gave a slide presentation on the 'Eua Expedition. This was an ecological survey for the Tongan government to determine plans to build a national park. 'Eua is one of the Tongan islands known for having the largest extent of native forest. Its mixture of topography, and substrate make it a unique island for preservation. His slides of the native Tongan plants here took us through different ecological zones of coastal lowlands, lowland forests, upland forest, ridge tops and treeless vegetation of the highest mountains. It was interesting to see that many of these native plants have affinities in the Hawaiian flora. His talk drew discussion and interest in Tongan plants.

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HAWAIIAN BOTANICAL SOCIETY
Annual Report 1990

by

Benton Keali'i Kiamoku Pang, Secretary

President Tom Ranker resigned in the summer months and meetings have since been chaired by officers and members of the Executive Committee

Meetings of 1990

8 January	Gerald D. Carr of UH Botany department: The Origin and Evolution of Hawaiian Tarweeds.
5 February	Kanehiro Kitayama of UH Botany Department: Plants of Mt. Kinabalu, Borneo

Plant of the month: Tim Motley of UH Botany Dept. Ethnobotany of *Acorus Calamus* (Sweetflag)

5 March	S.H. Sohmer, Botany Department, Bishop Museum: The Hunstein River Expedition, Paua New Guinea

Plant of the month: Wayne Borth, UH Plant Physiology Department: *Dodonaea viscosa*.

2 April Donald Falk, Center for Plant Conservation (Boston): Plant Endangerment in U.S.A.: What are we losing?

Plant of the month: Donald Farrar, Iowa State, visiting lecturer at UH Botany Department: Callistopteris, the most abundant fern in the Hawaiian Islands

7 May Donald Farrar, Iowa State, visiting lecturer at UH Botany Dept.: Stalking the Wild Gametophyte: A search for the origins and identities of wild fern gametophytes

Plant of the month: Tom Ranker, UH Hawaiian Evolutionary Biology Program: Adenophorus.

4 June Lu Eldredge, Pacific Science Association: Gardens and Fountains of Rome

Plant of the month: Benton K. Pang, UH Botany Department: Plants of Haleakala.

1 October George Staples, Botany Department, Bishop Museum: Pursuing Porana (Convolvulaceae) Across Asia.

5 November Michael Kristiansen, Honolulu Botanical Gardens: Projections of the Honolulu Botanical Gardens for Hawaiian Planting.

Plant of the month: Kanehiro Kitayama, UH Botany Department: A Plea to Save Threatened and Endemic Species in the Bonin (Ogasawara) Islands

3 December Donald Drake, UH Botany Department: A Report of the Vegetation and Flora of a Potential National Park in ‘Eua, Tonga

Plant of the month: Ron Fenstenmacher, Ho‘okahe Wai, Ho‘oulu ‘Aina: Plants of Ka Papa Lo‘i ‘O Kanewa

Excursions

Xeriscape Garden, Halawa Board of Water Supply

Makapu‘u end of Sandy Beach

Awards:

Science Fair Winners

Newsletter:

One Newsletter, vol. 29(1), was distributed in the month of March, 1990. The Society moved to reduce its inventory of the Hawaiian Botanical Society Newsletter. An archival set and 10 additional sets were kept by the Society and the rest was made available to the members. The Executive Committee also provided sets to the Bristish Natural History Museum and the Botanical Garden at Berlin. We arranged an exchange for “Willdenowia”, the journal of the Berlin Botanical Garden.

HAWAIIAN BOTANICAL SOCIETY NEWSLETTER
C/O DEPARTMENT OF BOTANY
UNIVERSITY OF HAWAII AT MANOA
3190 MAILE WAY
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Newsletter
Hawaiian Botanical Society

Volume 30 (2-4) **December 1991**
(Published July 1992)

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Secretary: Benton Pang (UH, Botany Department)
Directors: Isabella Abbott (UH, Botany Department)

Committees appointed by the Executive Council

Membership: Donald P. Gowing (Bishop Museum, Botany Department)
Newsletter: Editor: Clifford Smith (UH) assisted by Fiona M. Norris (Bishop Museum, Botany Department)
Conservation: Steve Montgomery (UH)

Science Fair: Rylan N.S. Yee (Data House)
David Fisher (UH,Botany Department)

Native Plants: Clifford Smith, Chair, (UH)
Ken Nagata, (Lyon Arboretum)
Evangeline Funk, (UH)
John Obata, (Bishop Museum)
Art Medeiros, (Haleakala National Park).

* * *

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MINUTES OF THE MEETING OF 7 JANUARY 1991

President Heidi Bornhorst opened the meeting at 7:30 p.m.

Minutes

The minutes were read by Donald Gowing and accepted without amendment.

Treasurer's Report

George Staples read the Treasurer's Report for the Month of December and for the year 1990. He pointed out that we spent $300.00 more than we took in and that we should be judicious about future donations.

New Business

It was announced that there would be a field trip to Ka Papa Lo'i o Kanewai on February 10, the Sunday following the February meeting at 9 a.m. on Dole Street, across Manoa stream from Frear Hall.

Lyndon Wester announced 2 weed-pulling parties at Koko Head. One on Sunday, 13 January, which will be with the Hawaii Audubon Society. Meet at Hanauma Bay parking lot at 8 a.m. and the same arrangements for Saturday, 26 January.

Joan Canfield reported the status of the court settlement suit against the U.S. Fish and Wildlife Service which included the Hawaiian Botanical Society. It required the Service to list 150 category 1 candidate species by 1992 (50 each year). Derral Herbst recently hired Joan Canfield, Zella Elshoff and Joan Yoshioka who are working on the requirements needed to list species. As of September 1990, 52 were proposed and to date 32 more are finished. Three plants thought to be extinct have been rediscovered, *Gouania vitifolia*, *Hedyotis coriacea*, and *Diella unisora*. Federal protection laws go along with State laws and our State has some protection laws regarding private property. Joan explained what has to be done to get a species listed as rare and endangered.

Scientific Program
Plant of the Month

Heidi Bornhorst introduced the Plant of the Month Speaker, Rick Palmer who is a graduate student at UH Manoa, doing his research on the genus *Trematolobelia*. The title of his presentation was: *Trematolobelia*, 'Amakihi and 'I'iwi, How to Study Plants and Bird Watch at the Same Time. He showed beautiful and unusual slides of *Trematolobelia* spp. in flower. One sequence of slides showed the Kaua'i 'Amakihi and 'I'iwi feeding on the flowers. He also shared with us some stunning pictures of lava flowing into the ocean in the moonlight which he had just taken over this recent New Year's Holiday.

Heidi Bornhorst also introduced our evening's speaker, Art Medeiros, who works for the Haleakala National Park. His title was: " Montane Bogs of Haleakala: Biology and Conservation".
Art told us there are 7 bogs on Maui, 5 in the Park, at an altitude of 4750-7500 ft. The first botanist to visit Wai'anapanapa was Forbes in 1919. The endemic bird life in Maui bogs is rich and he showed us slides of 'Amakihi, 'Apapane, 'I'iwi, Maui Creeper or "Maui Butterball", Crested Honeycreeper or 'Akohekohe, estimated at 3800 individuals, Maui Parrottbill, estimated at 500, and Nukupu'u, estimated at 40. There is fossil evidence of additional bird species such as rails and flightless geese.

He then showed us beautiful slides of many Maui bog endemic plants. A serious problem is a pig that appears to be a variety of barnyard swine believed to have originated from a piggery in 1929. He showed us slides of serious pig damage before fencing. There are 2 more bogs on West Maui-'Eke Crater and Pu'u Kukui and a bog on Kaua'i's Mount Wai'ale'ale, again with beautiful and unusual endemics to those areas. Wai'ale'ale had no pigs in the late 70's and early 80's, but recently there were large pigs up there doing considerable damage. National Parks, Nature Conservancy, DLNR, and Maui Land and Pineapple are working to save Maui and Moloka'i bogs, but Kaua'i's Wai'ale'ale Bog is unprotected. The Robinsons own part of the summit and land up to it. North and East is the state Alaka'i Wilderness area. At present there is no active management. However, hope lies in a new District Forester. The area is about 100 acres.

Respectfully submitted, Leilani Pyle, for the Secretary.

MINUTES OF THE MEETING OF 4 FEBRUARY 1991

President Bornhorst opened the meeting at 7:35 p.m.

Guests

Donald Gowing introduced Loyal Mehrhoff as a guest. He is the new research botanist at the Bernice Pauahi Bishop Museum. Dr. Abbott introduced Fiona and Richard Norris. Fiona is the new collections officer at Bishop Museum and Richard is a research assistant to Dr. Abbott. Anyone wanting to become a member was asked to see Dr. Gowing.

Minutes

The minutes of the January meeting were read and accepted without amendment. Secretary Pang thanked Leilani Pyle for taking the January minutes in his absence.

Treasurer's Report

The Treasurer's Report for January 1991 was read and accepted.

Membership Committee

Donald Gowing noted that Mr. and Mrs. Bradley F. Waters and Drs. Fiona and Richard Norris were accepted as members of the Society.

Old Business

George Staples reminded the members of the trip to Ka Papa Lo'i o Kanewai this Sunday to be led by Ron Fenstenmacher.

George Staples also announced that the Executive Board had approved continuing the support of the Science Fair by donating prizes this year as it had in the past.

New Business:

Dr. Abbott announced that Pacific Island Protection proposes a National O'ahu Wildlife Refuge at Kipapa gulch and the mountains of La'ie. She noted the importance not only of the endangered and potentially endangered plants, but also the endemic Hawaiian tree snails. She asked the Society for its support for the Refuge. After much discussion it was moved and accepted that Dr. Abbott would write a letter supporting the concept and that the Society would review the Environmental Assessment.

Scientific Program
Vice President Tim Motley introduced Benton Pang, graduate student at UH Manoa, as the Plant of the Month Speaker. His title was, "The Ethnobotany of Olona, (*Touchardia latifolia)* . He showed slides of the Hawaiian uses of this fiber plant. This plant was unique in the strength of the cordage derived from its fibers and in that it was the only endemic plant that was cultivated by the early Hawaiians. He also discussed his progress on seed propagation experiments that have never before been documented. It is hoped that more information on this plant can give us more insight to the cultural value as well as scientific data on this endemic plant.

Vice President Motley introduced Dr. Reinhard Heuttl, visiting professor in the Botany department at UH Manoa. His talk showed examples, problems and solutions of New Type Forest Damage in Europe and North America. Some of the problems were related to mineral deficiency, such as calcium or potassium deficiencies, that cause a yellowing of the leaves of conifer trees. Much of his research has followed two hypotheses: 1) dieback impact by gases and pollutants and 2) indirectly through the soil. The possibility that a virus was a factor was tested and was found insignificant. His slides of his past and current research on conifers in Europe and the U.S. were welcomed as a new topic for the Society.

Respectfully submitted,
Benton Keali'i Kiamoku Pang, Secretary

MINUTES OF THE MEETING OF 2 MARCH 1991.

President Bornhorst opened the meeting at 7:35 p.m.

Minutes
The minutes for February were read and accepted.

Treasurer's Report
The Treasurer's Report for February was read and accepted.

Membership committee
Donald Gowing proposed James Raich and Drs Loyal Mehrhoff and Ralph Riley for new members. All were accepted into the Society

Old Business
Secretary Pang gave a brief report on the field trip to Ka Papa Lo'i o Kanewai.
The secretary also sent the appropriate letters to the Metropolitan government of Tokyo about Anijima Island. A letter will be sent to the City and County of Honolulu about establishing a botanical garden near Makapu'u.

Scientific Program
The Plant of the Month speaker was Evangeline Funk, who discussed two endangered species and a weed. The weed was *Crassula siberiana* from Australia and now at Pohakuloa. The two endangered plants were *Ophioglossum concinum* and *Aubutilon menzesii*, both at Puako, Hawai'i.

Tim Motley introduced the speaker of the month, Peter McRoy, visiting professor from Fairbanks University, Alaska. As chief biologist for the Alaskan Oil spill on March 24, 1989 and scientific advisor of the Alaska State department of Conservation, Dr. McRoy gave his talk on the scientific efforts used during the Exxon Valdez oil spill.

Respectfully submitted,
Benton Keali'i Kiamoku Pang, Secretary

MINUTES OF THE MEETING OF 1 APRIL 1991

President Bornhorst opened the meeting at 7:35 p.m.

Minutes
The minutes of the March Meeting were read and accepted.

Membership committee
Dr. Gowing announced that Bernard Stearns, Rexford Palmer, and Allyson Joyce Gross were accepted as members of the Society

Old Business
Letters were sent to the City and County Director of Parks and Recreation regarding the establishment of a botanical garden at the Makapu'u end of Sandy Beach.

New Business
President Bornhorst told members to bring their plants and money to the June meeting for a plant raffle.

Scientific Program
The Plant of the Month speaker was President Bornhorst who spoke about the genus *Scaevola* in Hawai'i.

Tim Motley introduced the speaker of the month, Paul Weissich, Director Emeritus of the Honolulu Botanical Gardens. His talk focused on Xeriscape plants and Xeriscape landscaping in Hawai'i.

Respectfully submitted,
Benton Keali'i Kiamoku Pang, Secretary

MINUTES OF THE MEETING OF 5 MAY 1991

President Bornhorst called the Meeting to order at 7:30 p.m. and welcomed guests.

Minutes
The Minutes of the April Meeting were read and accepted .

Membership Committee
Beth Miura was admitted to membership in the Society.

Treasurer's Report
The Treasurer's Reports for March and April were read and accepted.

New Business
Lyndon Wester reported that weeding of the area and the recent heavy rains at Koko Head Crater had resulted in a renewed growth and development of the endemic population of *Marsilea villosa.*

President Bornhorst noted that the June Meeting will include a plant exchange. She also noted a call from the Newsletter Editor, Clifford Smith, for papers related to the purposes of the Society.

Scientific Program

Plant of the Month Speaker: Vice President Timothy Motley spoke on the Urticaceae of Ta'u Samoa. These range in size from small shrubs to full-sized trees. He described some interesting species from *Elatostema, Neraudia*, *Pilea,* and *Pipturus.*

The principal speaker was Dr. Loyal Mehrhoff of the Botany Department, Bishop Museum, who talked on his work with whorled *Pogonia* orchids in the montane forests of Eastern USA. His work compared and contrasted the reproductive biology of two species, *Isotria medeoloides* (rare, solitary) and *I. verticillata* (common, larger), both of which are self-compatible, but apparently require the help of some active agent for successful reproduction. In addition, he noted that the populations behaved differently, that there was an obvious relationship between individual behavior and population patterns, and also between individual plant vigor and the size of the population.

Respectfully submitted,
Benton Keali'i Kiamoku Pang, Secretary

MINUTES OF THE MEETING OF 3 JUNE 1991.

President Bornhorst called the Meeting to order at 7:30 p.m., and welcomed Burton C. Lum of the Hawaii Plant Conservation Center as a guest, and Drs. Herb and Florence Wagner, Society members from Michigan.

Minutes

The Minutes of the May Meeting were read and approved.

Treasurer's Report

The Treasurer's Report for May was read and accepted.

Membership committee

Burton C. Lum was admitted to membership in the Society.

New Business

The Sierra Club, Hawaii Chapter, is sponsoring a trail-building project at Maunawili, and invites participants.

There is correspondence from the USFWS on the listing of endangered species available for inspection by those interested.

The Executive Board has agreed that the Nature Conservancy, in its testimony in Federal hearings on threats from alien weed species, can also indicate the support of the Society.

The Halawa Xeriscape Garden offers unthirsty plants for sale.

Scientific Program

Dr. George Staples, of the Botany Department, Bishop Museum, spoke on "Pursuing *Porana* Across Asia, Part 2. [Part 1 was given in October 1990.] He described his research and collecting experiences in Burma and Thailand. He described the 7 floristic regions of Thailand, noting that each had its own botanic garden, and the talk was as informative and enjoyable as Part 1 had been.

A plant raffle was held as the usual refreshments were served.

Respecfully submitted,
Benton Keali'i Kiamoku Pang, Secretary

MINUTES OF THE MEETING OF 7 OCTOBER 1991

President Bornhorst called the Meeting to order at 7:30 p.m., and welcomed guests .

Minutes

The Minutes of the June Meeting were read and approved.

Treasurer's Report

The Treasurer's Report for June was read (by Vice President Motley) and acepted.

Membership Committee

Jill Laughlin, Joan C. Hare, and William J. Hahn were admitted to membership in the Society.

New Business
Announcements: The packets of the US Fish and Wildlife Service, on listing of endangered species, were available. Comments may be made up to 19 November.

A Nominating Committee (Benton Pang, Timothy Motley, and Leilani Pyle) was appointed, and will report to the Society at the November Meeting.

Scientific Program
The Plant of the Month Speaker was Vice President Motley, who discussed 4 plants from Kealakehe, Hawai'i, all endemics that grow on a'a lava amongst koa haole and *Schinus*. The plants were uhiuhi (*Caesalipinia kauaiensis*, listed as endangered), ‘aiea (*Nothocestrum breviflora*, a candidate for the endangered listing), *Neraudia ovata* (also a candidate), and *Isodendrion pyruvifolium.* This last species was thought to be extinct, since it had last been collected in 1870, but it was re-discovered by K. Nagata this year.

The principal speaker was Dr. Fiona Norris, Collections Manager, Botany Department Bishop Museum. Her talk was on the flora of South Africa, and after an introduction on the National Botanical Gardens there, she showed plants illustrating several different environmental regions in the Republic. The Cape Fynbos region holds the greatest diversity in the flora, but the forests, savanna, and high altitude grasslands also provide a very wide variety of plants, many of which are familiar to gardeners in Hawai‘i. Everyone appreciated this enlightening and enjoyable look at the rich flora of the area, and discussion continued in the refreshment period which followed.

Respectfully submitted,
Benton Keali‘i Kiamoku Pang, Secretary

MINUTES OF THE MEETNG OF 4 NOVEMBER 1991

Vice-President Motley opened the Meeting at 7:35 p.m., in the absence of the President, and welcomed guests.

Minutes
The Minutes of the October Meeting were read and approved.

Membership Committee
Keith Tomlinson was admitted to membership in the Society.

Old Business
The Nominating Committe proposed the following candidates for 1992 -- President, Timothy Motley; Vice-President, Loyal Mehrhoff; Secretary, Benton Pang; Treasurer, to be selected; and Directors, Isabella Abbott and Leilani Pyle. Nominations from the floor can be made at the Annual Meeting in December.

Dr. Steven Montgomery had earlier asked the Society for $100 in support of the printing and distribution costs of a poster describing the threat from a new alien weed species, *Miconia calvescens* . The Society had approved this, and Dr. Montgomery brought in copies of the poster.

New Business
Dr. Lyndon Wester asked the Society's help in building a gate at the Koko Head Crater, to protect the *Marsilea villosa* there from vehicular traffic.

Dr. Fiona Norris has accepted the editorship of the Newsletter, following Dr. Clifford Smith, who has served a most appreciative Society for 14 1/2 years.

Dr. R. Fenstemacher asked the Society for a letter of support to be addressed to the University, requesting that it reconsider present plans for siting the new Hawaiian Studies Building. The plans now call for it to be located near the Diamond Head end of the lo'i. This would interfere with the auwai, the canal supplying water to the rare and endangered plant collection now growing there. He stressed that the group involved with the lo'i, Ho'okahi Wai Ho'oulu 'Aina, fully supports the new center for Hawaiian Studies, but that this group should be consulted on the matter of the site. V.P. Motley appointed Benton Pang and Loyal Mehrhoff as a committee to draft the letter.

Scientific Program
Plant of the Month Speaker Benton Pang talked on Ka Uluwehi o Ke Kai, Hawaiian uses of Limu, describing the traditional and contemporary uses, and the areas where the suitable seaweeds can be found.

The principal speaker was Dr. Charles Lamoureux, Associate Dean of the College of Arts and Sciences, University of Hawaii. His title was "The Spice Islands, Where History and Botany Converge". He illustrated his review of the regional history and geography, and the work of Rumphius and others since, with his excellent slides. It was a both a most informative and enjoyable presentation

Respectfully submitted,
Benton Keali'i Kiamoku Pang, Secretary

MINUTES OF THE ANNUAL MEETING OF 2 DECEMBER 1991.

President Bornhorst called the meeting to order at 7:30 p.m., and welcomed the guests.

Minutes

The Minutes of the November Meeting were read and approved.
The review of the year's activities was presented by the secretary and is reproduced below.

Treasurer's Report

The Treasurer's Reports for November, and for the year, were read. Treasurer Staples noted that an auditor should be appointed. He was thanked for his services, and it was noted that there will be a new Treasurer in the coming year.

Membership Committee

Kevin Beach, Peter Schuyler, Sterling Keeley, and Coleen Cory were admitted to membership in the Society. Chairman Gowing noted that Society now numbers 163 members, down slightly from the previous year.

New Business

Dr. David Fisher of the UH Botany Dept. will be leaving for a new position, and we will need another representative for the Science Fair activity.

Zella Ellshoff of the USFWS distributed information relating to the Service's current and proposed listings of endangered plants, in which the Society has taken an active interest.

The candidates proposed by the Nominating Committee were presented, and there were no other nominations. Hence, the following were elected, by acclamation, for 1992:-

President	Timothy Motley, Graduate Student, U.H.
Vice-President	Loyal Mehrhoff, Botany Dept., Bishop Museum
Treasurer	Kevin Beach, GraduateStudent, U.H.
Secretary	Benton Pang, Graduate Student, U.H.
Directors	Isabella Abbott, Botany Dept., U.H. Leilani Pyle, Botany Dept., Bishop Museum.

The retiring President, Heidi Bornhorst, the Editor of the Newsletter, Fiona Norris, and the Chairman of the Membership Committee, Donald Gowing, serve ex officio with the officers above as the Executive Board of the Society.

Scientific Program

Plant of the Month: Donald Drake, Graduate Student, U.H, "Some endemic species of the Island of Hawaii."

Principal Speaker :The Presidential Address, by Heidi Bornhorst, was "Where do we stand on xeriscape plantings with native plants? She illustrated her talk with slides of native Hawaiian plants particularly suited to drought, and showed examples of landscaping by hotels using such materials.

REVIEW OF THE YEAR

Officers and members of the Executive Board for the year have been:-

President -- Heidi Bornhorst, The Nature Conservancy, Hawai'i
Vice President -- Timothy Motley, Graduate Student, Botany Department, UH
Secretary -- Benton K. K. Pang, Graduate Student, UH
Treasurer -- George Staples, Botany Dept., Bishop Museum
Directors -- Isabella Abbot, Botany Dept., UH
Leilani Pyle, Botany Dept., Bishop Museum

Society activities

Society members have assisted in maintaining the *Marsilea villosa* reserve at Koko Head in weeding parties on several occasions.

There was a field trip in February under the leadership of Dr. R. Fenstemacher, to Ka Papa Lo'i O Kanewai, for familiarization with these plantings of endemics off Dole St.

The Society wrote several letters to government agencies, on preserving a native forests on Anijima Island (Saipan); on establishing a botanical garden at Makapu'u; and others.

We participated in the Science & Engineering Fair, providing judges and awards in relation to botany.

We supported the Earth Day program, and the printing of a poster on an alien weed (*Miconia calvescens*) which has become a severe pest elsewhere.

Scientific Programs

January

Plant of the Month, Richard Palmer, Grad. Student, Botany, U. of H., "*Trematalobelia,* 'Amakihi, and 'I'iwi: How to study plants and bird watch at the same time."

Principal Speaker, Arthur Medeiros, Haleakala National Park, "Montane bogs of Haleakala: Biology and conservation."

February

Plant of the Month, Benton Pang, Grad. Student, U. of H., "Ethnobotany of olona (*Touchardia latifolia*)." Principal Speaker, Reinhard Huettl, Botany Dept., U. of H., "New type forest damage in Europe and North America."

March

Plant of the Month, Evangeline Funk, Botanical Consultants of Hawaii, "On two endangered species [*Ophioglossum concinnum, Abutilton menziesii]* and a weed [*Crassula siberiana*]."

Principal Speaker, Peter McRoy, Fairbanks Univ., Alaska, "New troubles with very, very, old plants -- the Alaskan oil spill."

April

Plant of the Month, Heidi Bornhorst, The Nature Conservancy of Hawai'i, " The genus *Scaevola* "

Principal Speaker, Paul R. Weissich, Director Emeritus, Honolulu Botanic Gardens, "Trends in Hawaiian Landscaping."
May
Plant of the Month, Timothy Motley, Graduate Student, U. of H., "Urticaceae of Ta'u, Samoa."
Principal Speaker, Loyal Mehrhoff, Botany Dept., Bishop Museum, "The biology of whorled *Pogonia* orchids."
June
Principal Speaker, George Staples, Botany Dept., Bishop Museum, "Pursuing *Porana* across Asia, Part 2."
October
Plant of the Month, Timothy Motley, Graduate Student, U. of H., on "Four rare endemics from Kealakehe, Hawaii."
Principal Speaker, Fiona Norris, Botany Dept., Bishop Museum, on the "Flora of southern Africa."
November
Plant of the Month, Benton Pang, on "Ka Uluwehi o Ke Kai, Hawaiian uses of limu."
Principal Speaker, Dr. Charles Lamoureux, Assoc. Dean, College of Arts & Sciences, U. of H., "The Spice Islands, where history and botany converge".
December
Plant of the Month, Donald Drake, Graduate Student, U. of H., "Some endemic plants of the Big Island."
Principal Speaker, Heidi Bornhorst, the Nature Conservancy, Hawai'i, "Where do we stand on xeriscape plantings with native Hawaiian plants?

Respectfully submitted,
Benton Keali'i Kiamoku Pang, Secretary

NATIONAL TROPICAL BOTANICAL GARDEN

Press Release

The Hawaii Plant Conservation Center of the National Tropical Botanical Garden has been awarded a 3-year grant by the John D. and Catherine T. MacArthur Foundation for major support of its work in native plant conservation. This is the second 3-year grant that the MacArthur Foundation has awarded to the NTBG's Hawaii Plant Conservation Center (HPCC). The HPCC carries out vital conservation work to collect and propagate native plant species as well as to conduct educational outreach programs.

Ten new undescribed species have been discovered, and five native Hawaiian plants previously considered by scientists to be extinct. Tables 1 and 2 below give some pertinent information.

Over 90 percent of the flowering plants in Hawaii are unique to the islands, a far greater percentage than anywhere else on earth. Of those plants, well over one-half are now considered extinct, threatened or endangered. Many of these are now flourishing at NTBG.

The State of Hawaii and the National Center for Plant Conservation also support NTBG's work with Hawaiian plants. Both have recently renewed funding which will be used to protect and grow these precious resources, including many which have never been studied before. The National Tropical Botanical Garden now has the largest living collection of native Hawaiian plants in the world.

NTBG is chartered by the United States Congress as a research and education garden to study and conserve the world's tropical plants. The NTBG's headquarters garden is located in Lawai, Kauai. NTBG also has gardens and preserves on the islands of Kauai, Maui, and Hawaii, and in south Florida. With collections of tropical plants from all over the world, including many threatened and endangered species.

For more information about the HPCC please write or call:

Dr. Diane Ragone, HPCC Coordinator
Hawaii Plant Conservation Center, Lawai, HI 96765
(808) 332-7324

TABLE 1: Collections of species believed to be extinct, or not recently seen

Species	Island	Status
Alsinidendron viscosum	Kauai	Listed as extinct,last collected in 1917
Cyanea linearifolia	Kauai	Listed as extinct, last seen in 1909
Cyanea remyi	Kauai	Last seen in 1850's
Cyanea undulata	Kauai	Listed as extinct, last seen in 1909
Cyanea cyaneoides	Kauai	Listed as extinct, seen in early 1900's
Gardenia remyi	Kauai	Possibly not seen here in 70 years
Hedyotis coriacea	Maui/HI	Listed as extinct, last seen in late 1800's
Hedyotis mannii	Lanai	Last seen in 1912
Melicope quadrangularis	Kauai	Listed as extinct. last seen in 1909
Poa mannii	Kauai	Listed as extince, last seen in 1916
Schiedea stellarioides	Kauai	Listed as extinct, last seen in 1916
Tetramolopium arenarium	Hawaii	Listed as extinct, last seen in late 1800's

TABLE 2: New Island Records or new populations

Species	Island	Status
Bidens campylotheca	Kauai	New island record
Brighamia insignis	Kauai	Newly discovered population, only 2 plants
Delissea rhytidosperma	Kauai	New plant, new population
Euphorbia haeleeleana	Kauai	New population
Gouania mayenii	Kauii	New island record.
Hesperomannia arborescens	Kauai	New population
Hesperomannia lydgatei	Kauai	New location
Hibiscadelphus distans	Kauai	New location
Melicope pallida	Kauai	New location
Ranunculus mauiensis	Maui	New location
Remya mauiensis	Maui	Only area known
Remya montgomeryi	Kauai	New location
Schiedea membranacea	Kauai	New location
Schiedea nuttalli	Kauai	Only population known on island
Schiedea spergulina leiopoda	Kauai	Only known population
Schiedea spergulina spergulina		Kauai New location
Silene lanceolata	Oahu	Only one plant, new island record
Viola helenae	Kauai	Largest population ever found.

HAWAIIAN ENDANGERED AND THREATENED PLANT TAXA

Zella E. Ellshoff
U.S. Fish and Wildlife Service

In December 1989, conservation groups (including the Hawaiian Botanical Society) represented by the Sierra Club Legal Defense Fund filed an action in Federal District Court in Honolulu against Manuel Lujan, Secretary of the Interior. In the action, it was alleged that the Department of the Interior and the Fish and Wildlife Service ("Service") were violating the Endangered Species Act by failing to list Category 1 Hawaiian plants as endangered or threatened in a timely manner. A Category 1 plant is one for which the Service has on file substantial information on biological vulnerability and threat(s) to support a proposal to list it as an endangered or threatened species. An endangered species is one which is in danger of extinction throughout all or a significant portion of its range. A threatened species is one which is likely to become endangered within the foreseeable future throughout all or a significant portion of its range.

In January 1990, the Department of the Interior responded to the allegations, and in May 1990 a settlement agreement was reached. The Department of the Interior agreed that the Fish and Wildlife Service would propose for listing 186 Hawaiian plant species, 50 by the end of September 1990 and the remaining by September 30, 1992. A listing proposal is a proposed regulation published in the Federal Register which would determine that a species is endangered or threatened. Usually within a year a final determination is published.

Progress on listing proposals has been efficient since the settlement of the law suit, and, as of the end of 1991, a total of 63 taxa were listed as endangered or threatened, 65 additional taxa had been proposed for listing, and 50 more taxa had listing proposals in preparation. This fast pace of proposing species for listing has been possible because of a methodical technique of assembling resources and writing listing packages. The Manual of the Flowering Plants of Hawai'i, the new flora of the Hawaiian Islands published by the University of Hawaii Press and Bishop Museum Press and co-authored by the Service's Pacific Islands Office senior botanist, Derral Herbst, updated and compiled into one source all the currently known information about the taxonomy and distribution of the flora and has been an invaluable resource in this process. Members of other organizations involved in field work on Hawaiian plants have been very cooperative in sharing up-to-the-minute knowledge about distributions and conditions of species being proposed for listing. Information provided by the Hawaii Heritage Program of The Nature Conservancy of Hawaii has been especially helpful. Grouping species by ecosystem or geographical area has allowed from 2 to 26 species to be proposed at once, and such factors as habitat descriptions, land ownerships, and threats can be handled for the entire group rather than repeating the same information in different listing proposals for each species.

Following is a table summarizing progress which has been made in listing Hawaiian plant species:

SUMMARY TABLE
HAWAIIAN ENDANGERED AND THREATENED
PLANT TAXA

Already listed	63 taxa
Proposed for listing	65 taxa
Proposals in preparation	50 taxa
To be proposed	10 taxa
GRAND TOTAL	188 taxa

Following is a list of plant taxa that have been listed, that have been proposed, for which listing packages are being prepared, or for which packages will be prepared. Listed and proposed are endangered unless indicated as being threatened.

LISTED ENDANGERED AND THREATENED HAWAIIAN PLANT TAXA
(63 taxa)

Abutilon eremitopetalum
Abutilon menziesii
Abutilon sandwicense
Achyranthes splendens var. rotundata
Alsinidendron obovatum
Alsinidendron trinerve
Argyroxiphium sandwicense ssp. sandwicense
Bidens cuneata
Caesalpinia kavaiensis
Centaurium sebaeoides
Chamaesyce celastroides var. kaenana
Chamaesyce kuwaleana
Chamaesyce skottsbergii var. skottsbergii
Cyanea macrostegia var. gibsonii
Cyanea pinnatifida
Cyanea superba
Cyanea undulata
Diellia falcata
Dubautia herbstobatae
Dubautia pauciflorula
Gahnia lanaiensis
Gardenia brighamii
Gouania hillebrandii
Gouania meyenii
Haplostachys haplostachya
Hedyotis degeneri
Hedyotis parvula
Hedyotis st.-johnii
Hesperomannia arbuscula
Hesperomannia lydgatei
Hibiscadelphus distans
Isodendrion hosakae
Kokia cookei
Kokia drynarioides
Labordia lydgatei
Lipochaeta lobata var. leptophylla
Lipochaeta tenuifolia
Lipochaeta venosa
Lobelia niihauensis
Neraudia angulata
Nototrichium humile

Panicum fauriei var. carteri
Phyllostegia glabra var. lanaiensis
Phyllostegia mollis
Remya kauaiensis
Remya mauiensis
Remya montgomeryi
Sanicula mariversa
Santalum freycinetianum var. lanaiense
Scaevola coriacea
Schiedea adamantis
Schiedea apokremnos
Schiedea kaalae
Silene perlmanii
Stenogyne angustifolia
Tetramolopium filiforme
Tetramolopium lepidotum ssp. lepidotum
Tetramolopium remyi
Urera kaalae
Vicia menziesii
Viola chamissoniana ssp. chamissoniana
Viola helenae
Viola lanaiensis

PROPOSED ENDANGERED AND THREATENED HAWAIIAN PLANT TAXA (65 taxa)

Acaena exigua
Alectryon macrococcus
Argyroxiphium kauense
Argyroxiphium sandwicense ssp. macrocephalum (Threatened)
Bidens micrantha ssp. kalealaha
Bidens wiebkei
Brighamia insignis
Brighamia rockii
Canavalia molokaiensis
Chamaesyce halemanui
Clermontia oblongifolia ssp. brevipes
Clermontia oblongifolia ssp. mauiensis
Cyanea asarifolia
Cyanea lobata
Cyanea mannii
Cyanea mceldowneyi
Cyanea procera

Cyrtandra limahuliensis
Cyrtandra munroi
Delissea rhytidosperma
Diellia laciniata
Dubautia latifolia
Exocarpos luteolus
Geranium arboreum
Geranium multiflorum
Hedyotis cookiana
Hedyotis coriacea
Hedyotis mannii
Hibiscus arnottianus ssp. immaculatus
Hibiscus clayi
Huperzia (Lycopodium) mannii
Lipochaeta fauriei
Lipochaeta kamolensis
Lipochaeta micrantha
Lipochaeta waimeaensis
Lysimachia filifolia
Lysimachia lydgatei
Marsilea villosa
Melicope haupuensis
Melicope knudsenii
Melicope mucronulata
Melicope pallida
Melicope quadrangularis
Melicope reflexa
Munroidendron racemosum
Nothocestrum peltatum
Peucedanum sandwicense
Phyllostegia mannii
Phyllostegia waimeae
Poa sandvicensis
Poa siphonoglossa
Pritchardia munroi
Pteralyxia kauaiensis
Schiedea haleakalensis
Schiedea lydgatei
Schiedea spergulina
Silene alexandri
Silene lanceolata
Solanum sandwicense
Stenogyne bifida

Stenogyne campanulata
Stenogyne kanehoana
Tetramolopium rockii (Threatened)
Wilkesia hobdyi
Xylosma crenatum

OTHER HAWAIIAN PLANT TAXA WITH LISTING PACKAGES CURRENTLY BEING PREPARED (50 taxa)

Koolau Mountains, Oahu, Package
Chamaesyce deppeana
Cyanea truncata
Cyrtandra crenata
Cyrtandra polyantha
Eugenia koolauensis
Hesperomannia arborescens
Lobelia oahuensis
Lycopodium nutans
Melicope lydgatei
Rollandia crispa
Tetraplasandra gymnocarpa

Island of Nihoa Package
Amaranthus brownii
Pritchardia remota
Schiedea verticillata

Island of Hawaii Package
Clermontia lindseyana
Clermontia peleana
Clermontia pyrularia
Colubrina oppositifolia
Cyanea copelandii ssp. copelandii
Cyanea hamatiflora ssp. carlsonii
Cyanea shipmanii
Cyanea stictophylla
Cyrtandra giffardii
Cyrtandra tintinnabula
Hesperocnide sandwicensis
Hibiscadelphus giffardianus
Hibiscadelphus hualalaiensis
Ischaemum byrone
Isodendrion pyrifolium

Mariscus fauriei
Nothocestrum breviflorum
Ochrosia kilaueaensis
Plantago hawaiensis
Portulaca sclerocarpa
Pritchardia affinis
Silene hawaiiensis
Tetramolopium arenarium
Zanthoxylum hawaiiense

Multi-Island Package
Adenophorus periens
Bonamia menziesii
Diellia erecta
Flueggea neowawraea
Hibiscus brackenridgei
Mariscus pennatiformis
Neraudia sericea
Plantago princeps
Sesbania tomentosa
Solanum incompletum
Spermolepis hawaiiensis
Vigna o-wahuensis

OTHER HAWAIIAN PLANT TAXA TO BE PROPOSED BEFORE OCTOBER 1992 (10 taxa)

Waianae Supplemental Package
Cyanea grimesiana ssp. obatae
Diellia unisora
Gouania vitifolia

Fern Package
Asplenium fragile
Ctenitis squamigera
Diplazium molokaiense
Pteris lidgatei

Single Species Packages
Hibiscadelphus crucibracteatus
Pritchardia aylmer-robinsonii
Tetramolopium capillare

CONFERENCE ANNOUNCEMENT

PLANT STRESS IN THE TROPICAL ENVIRONMENT

September 20-25, 1992
Kailua-Kona, Hawaii

Sponsored by:

U.S. Department of Agriculture
The Pacific Basin Advisory Group
The Carribean Basin Advisory Group
College of Tropical Agriculture & Human Resources
The University of Hawaii

PLANT STRESS in the **TROPICAL ENVIRONMENT** September 20-25 1992. This workshop, sponsored by the USDA and the Caribbean and the Pacific Basin Advisory Groups, will focus on environmental stress on plants in the Tropics. Using the 'Gordon Conference' format, the meeting will assess the impact of environmental stress on tropical agriculture, identify information gaps and stimulate future research on tropical plants. Conference organization is under the chairmanship of H. Michael Harrington, College of Tropical Agriculture and Human Resources, University of Hawaii at Manoa, Tel. (808)-956-6069.

Society Members may obtain a copy of the brochure, that includes a registration form by calling Dr Harrington during business hours.

CONFERENCE ANNOUNCEMENT

The 19th Annual Natural Areas Conference and the 14th Annual Meeting of the Natural Areas Association will be held on the Indiana Campus in Bloomington, Indiana from October 27-30 1992.

Conference topics include:

Natural area conservation and protection (national and international)
Rare Species inventory, management, monitoring and recovery
Social aspects of natural area management
Public land management
Disturbances in natural systems
Urban natural areas
Natural area management (including exotics, visitor impact etc.)
Forest fragmentation
Old growth forests
Building big reserves
Climatic change and other global issues, and
Great Lakes system.

To receive further information and a brochure on registration, please contact Natural Areas Conference Registration, Division of Nature Preserves, 402 West Washington Street, Room W267, Indianapolis, Indiana 46204 (317-232-4052)

BOOK REVIEW

SEABIRDS: AN IDENTIFICATION GUIDE. Paperback Edition 1991.
Peter Harrison. Houghton Mifflin Co., 1 Beacon St., Boston MA
02108. 448 pp. and 88 color plates. $ 24.95 paperback and
$ 35.00 in hardcover.

When the original hardcover edition of this field guide was published in 1983, it was immediately praised as the definitive identification guide for the seabirds of the world. Prior to its publication, W.B.Alexander's 1928 publication was the standard seabird guide.

Compiling a worldwide guide was a massive undertaking. The author and artist, Peter Harrison, traveled the globe and spent eleven years gathering information,writing and illustrating the book.

The guide contains species accounts, and color range maps, of 312 different seabirds and 88 color plates. It covers 19 families of seabirds in full, from King Penguins to Parakeet Auklets. It also has an abbreviated section on those waterfowl (Anatidae) normally referred to as "seaducks", such as mergansers, scoters and eiders.

The front sections of the guide contain a glossary of terms,an illustration of seabird "topography" and a quick summary of the major seabird groups, stressing comparative characters most useful for field identification.

The seabird species commonly seen in and near Hawaii are well covered. The arrangement of the color plates allows the reader to compare the true Fairy Tern (*Sterna nereis*, from Australia) with Hawaii's White Tern (*Gygis alba*) also popularly, but incorrectly, referred to as a Fairy Tern.

The color plates illustrate over 1600 birds of the 312 species, in various plumages, covering in some detail the confusing adult breeding, adult non-breeding, sub-adult, first and second winter plumages and so on. Although it is well known that Hawai'i has breeding populations of terns, but not of gulls, gulls do sometimes find their way to Hawai'i. This guide has good illustrations and summaries to help the inexperienced observer to sort out the numerous plumages. Some readers may prefer photos to artwork, but, as Roger Tory Peterson pointed out in the foreword, a photo is a split-second record whereas as drawing is a composite of the artist's field knowledge of the bird and conveys more information.

This field guide definitely belongs in the field pack or reference library of every professional ornithologist, serious birdwatcher and natural history buff in Hawai'i.

Marie P. Morin

Directory of Sources for Native Hawaiian Plants

The Hawaii Plant Conservation Center is a special program of the National Tropical Botanical Garden dedicated to the study and conservation of native Hawaiian plants, especially rare and endangered species. It was founded in 1989 with a grant from the John D. and Catherine T. MacArthur Foundation.

A *Directory of Sources for Native Hawaiian Plants* has been produced by the Hawaii Plant Conservation Center. This directory answers the growing need for information about how to obtain native Hawaiian plants for use in landscaping. While Hawaii is renowned for beautiful tropical gardens, most of the plants commonly used in landscaping have been introduced from other parts of the world. Part of the work of the Hawaii Plant Conservation Center has been to encourage the horticultural use of native Hawaiian plants through education programs.

A directory of commercial nurseries and individuals throughout the state who offer native plants for sale and those who offer support services was compiled. Over 400 growers in Hawaii were surveyed, and the resulting *Directory of Sources for Native Hawaiian Plants* has been produced for sale. The directory lists source names by island, with mailing addresses and phone numbers; percentage of business in native plants and specific native plants available; services provided; and shipping area. Illustrations of selected species are included, along with brief descriptions and a key to Hawaiian names.

For more information and order forms, please contact:

Colleen Lopez, Education Coordinator
Hawaii Plant Conservation Center, National Tropical Botanical Garden
P.O. Box 340, Lawai, Kauai, Hawaii, 96765.
(808) 332-7324, FAX 332-9765

Hawaii Plant
Conservation Center
of the
National Tropical Botanical Garden

PUBLICATION HISTORY, NEWSLETTER, HAWAIIAN BOTANICAL SOCIETY

Volumes 1-13 were in a 8.5″ x 11″ format, Vols. 14-30 in a 6.5 x 8.5″ format. Issues out of print can be supplied as Xerox copies (10 cents per page, if in excess of the price shown below).

Vol.	Year	Issues	Pages	Notes	Dues at the time
1	1962	8	43	Some numbers out of print	$2.00
2	1963	9	144	Some numbers out of print	2.00
3	1964	5	40	Some numbers out of print	2.00
4	1965	5	34		2.00
5	1966	5	53	Nos. 4+5 combined, issued 1967	3.00
6	1967	5	44	Nos. 1+2 combined	3.00
7	1968	5	40	Issue 3 (June) shows as Vol. VI	3.00
8	1969	3	30	Some issues out of print	3.00
9	1970	5	48	Nos. 1+2+3 combined	3.00
10	1971	5	58		3.00
11	1972	5	52		5.00
12	1973	5	35		5.00
13	1974	5	25		5.00
Index to Vol.1-13			17	Index priced at $1.00	(1.00)
14	1975	5	123	New format.Some now out of print	5.00
15	1976	5	96	Nos. 1+2 combined. Some issues now out of print.	5.00
16	1977	5	79	Nos. 1+2, 3+4 combined	5.00
17	1978	5	83	Nos. 1+2, 3/5 combined	5.00
18	1979	5	59	Nos. 1+2, 3/5 combined; Nos. 3/5 bound with Vol. 19	7.50
19	1980	1	63	Cover shows Vol. 18 3/5; Vol. 19 starts at p. 60	7.50
20	1981	1	27	Cover labelled "Vol. 21"	7.50
21	1982	1	27		7.50
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24	1985	3	95		7.50
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26	1987	4	79		7.50
27	1988	4	131		7.50
28	1989	4	83		7.50
29	1990	4	63		7.50
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Index, Vols.26-30			15	Issued July 1992	--

NEWSLETTER OF THE HAWAIIAN BOTANICAL SOCIETY
C/O DEPARTMENT OF BOTANY
UNIVERSITY OF HAWAII AT MANOA
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Newsletter
Hawaiian Botanical Society

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Published by the Hawaiian Botanical Society, which was founded in 1924 to "advance the science of botany in all its applications, encourage research in botany in all its phases, promote the welfare of its members and develop the spirit of good fellowship and cooperation among them." Any person interested in the plant life of the Hawaiian Islands is eligible for membership. Information may be obtained from the Society, c/o Department of Botany, 3190 Maile Way, University of Hawaii, Honolulu, Hawaii 96822.

OFFICERS OF THE HAWAIIAN BOTANICAL SOCIETY 1992

Executive Council

President: Timothy Motley (UH, Botany Department)
Vice-President: Loyal Mehrhoff (Bishop Museum, Botany Department)
Treasurer: Kevin Beach, (UH, Botany Department)
Secretary: Benton Pang (UH, Botany Department)
Directors: Isabella Abbott (UH, Botany Department)
Leilani Pyle, (Bishop Museum,Botany Department)

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Newsletter: Editor: Fiona M. Norris (Bishop Museum, Botany Department)
Conservation: Steve Montgomery (UH)

Science Fair: Benton Pang (UH, Botany Department)
Winona Char (Char and Associates)

Native Plants: Clifford Smith, Chair, (UH)
Ken Nagata, (Lyon Arboretum)
Evangeline Funk, (UH)
John Obata, (Bishop Museum)
Art Medeiros, (Haleakala National Park).

* * *

MEMBERSHIP

The Society year is from 1 December through 30 November.

Regular Membership is $ 7.50 per year
Student membership is $ 4.00 per year
Family Membership is $10.00 per year
Life Membership (individuals only) is $150.00

Honorary and Life Members pay no further dues.

MINUTES OF THE MEETING OF JANUARY 6, 1992

President Timothy Motley called the first meeting of 1992 to order at 7:40 p.m.

Minutes

Secretary Benton Pang read the minutes for the December meeting.

Treasurer's Report

The Treasurer's Report was read by Secretary Pang in the absence of Treasurer Kevin Beach.

Membership Committee

Membership Committee Chairman Gowing reported the passing, on December 12, 1991, of Dr. Harold St. John, Professor of Botany (Emeritus) at the University of Hawaii, Manoa, for many years a researcher at the Bishop Museum, and a long time member of the Hawaiian Botanical Society. All will miss his contributions to Hawaiian Botany and his faithful presence at our meetings.

Dr. Gowing also noted that Sagarika Dash had joined the Society as a student member, and recorded that the following had chosen Life Membership in the Society: Dr. Charles H. Lamoureux, Dr. Daniel D. Palmer, Mr. Toshihiko Ikagawa.

Special Committee Report: Ka Papa Lo'i o Kanewai

Dr. Mehrhoff read the draft letter to the University Board of Regents, requesting that they reconsider the current plans on the siting the new Hawaiian Studies Building. The letter was approved by the Society.

New business:

Geary Mizuno has made a donation of $125 to the Society for the Neal-Miller Fund, which is used in support of projects in the public interest.

The Royal Botanical Garden at Kew has requested back issues of the Newsletter, which will be supplied at cost, on approval of the Executive Board.

President Motley read a letter from Dr. Elizabeth Anderson, Society member, making some suggestions for increasing membership and attendance at meetings.

Scientific Program

The Plant of the Month Speaker was introduced by President Motley. Dr. Loyal Mehrhoff, of the Botany Department Bishop Museum, talked about his research in the reproductive biology of two rare varieties of the lobeliad, *Cyanea grimesiana.*

Vice President Mehrhoff then introduced the principal speaker, Coleen Cory of the University of California at Irvine. Her title was "Hummingbird Pollination at Wilson Botanic Garden, Costa Rica. After describing the garden, she discussed her most interesting research involving the factors affecting pollination of native and non-native plants by the several species of hummingbirds common in the area.

Respectfully submitted,
Benton Keali'i Pang, Secretary.

MINUTES OF THE MEETING OF 3 FEBRUARY 1992

President Motley opened the meeting at 7.30 pm and introduced the guests: Richard Stark, Mark Franklin and Cliff Morden.

Minutes

The minutes of the meeting of 6 January were read and accepted.

Treasurer's Report

The Treasurer's report was read and accepted.

Special Committee

The letter to President Simone regarding Ka Papa Lo'i o Kanewai will be sent out soon.

Matters arising from the executive meeting

The Executive Committee proposed to allocate $400 from the Neal-Miller fund to the production of an Earth Day poster.
The motion was seconded and accepted.

President Motley read the reply to Elizabeth Anderson.

The Society still requires an Auditor.

New Business
Dr S.H. Sohmer introduced Artis Vinas, Curator of the Bulolo Forestry Institute Herbarium and Dr Ben Stone of the Flora of Philippines Project. He also announced that Dr Wayne Takeuchi had taken a post with the State of Hawaii and that the Botany Department was looking for a replacement to assume duty as a plant collector in Papua New Guinea.

Secretary Pang announced a seminar on Landscaping with Native Plants to be held on Saturday 29 February at the Ho'omaluhia Botanical Garden.

Secretary Pang also announced the introduction of a bill declaring melastomes as plant pests.

Scientific Program
Speaker for the Plant of the Month, Dr Bill Magruder, was introduced by Vice-President Mehrhoff. The topic was the spread of *Cladophora* in the waters off Ka'anapalo, Maui. Dr Magruder showed a video of the algal bloom.

Vice-President Mehrhoff then introduced Bill Garnett of The Nature Conservancy, Hawaii who spoke on the Gardens and Botanical resources of the Indo Pacific.

After the scientific program, Ted Green gave a brief 'show and tell'. Refreshments were served at the close of the meeting.

Respectfully submitted,
Benton Keali'i Pang, Secretary.

MINUTES OF THE MEETING OF 2 MARCH 1992

The President, Tim Motley, opened the meeting at 7.40 pm

Minutes
Minutes of the Meeting of 3 February were read and accepted.

Treasurer's Report
The Treasurer's report was read and accepted.

Old Business

No auditor has been found for the Society's books.

New Business

The Nature Conservancy of Hawai'i is not extending its preserve management of the *Marsilea villosa* population at Koko Head at the end of its tenure on March 30. It will recommend that the Sierra Club take over the responsibility.

A request was made that reading of the minutes and treasurer's reports be replaced by tabled documents. This matter will be discussed by the Executive committee with reference to the constitution and addressed at the next meeting of the Society.

Scientific Program

Vice-President, Loyal Mehrhoff, introduced the speaker for the Plant of the Month: Scott Medbury of the Honolulu Botanical Gardens. The topic was "Araliaceous Trees presently in growing at the Wahiawa Botanical Garden"

The Vice-President introduced the speaker of the month: Kevin Beach, graduate student in the Botany Department at the University of Hawai'i at Manoa. His talk was entitled "Algal Succession on New Lava Flows." Mr Beach included a literature survey on research on marine succession but focussed on his own interests in marine succession on the intertidal areas on the Big Island, Hawai'i.

Refreshments were served at the conclusion of the meeting.

Respectfully submitted,
Benton Keali'i Pang, Secretary.

A NEW AND INVASIVE PAMPAS GRASS ON MAUI

by

Lloyd Loope and Arthur C. Medeiros

We have recently discovered that instead of a single species, two very similar South American species of pampas grass, *Cortaderia selloana* (Schult.) Asch. & Graebn. and *Cortaderia jubata* (Lem.) Stapf, are ornamentals and sparsely naturalized in upcountry Maui. Until now, only *C. selloana* has been recognized in the literature as occurring in Hawai'i. *Cortaderia jubata* is an aggressive weed in California and elsewhere, and is clearly an undesirable introduction to the Hawaiian Islands. Both species are similar bunch grasses with coarse saw-edged leaves well over 1.5m in length and silvery, plume-like inflorescences on stalks 2m or more in length. Our tentative identification of the second Maui species as *C. jubata* was recently confirmed by Dr. Paul Peterson at the U.S. National Herbarium in Washington D.C. The two species are most easily distinguished by floral characters and the presence of abundant hairs on the culm sheath and abaxial leaf sheath of *C jubata* (vs. glabrous, or nearly so, in *C. selloana*).

We have been aware of a large stand of *Cortaderia* on private land along Haleakala Highway at an elevation of 1,000 m for nearly a decade, but inquiries to the landowner have been unproductive. Beginning in 1987-88, seedlings of *C. jubata,* became apparent along Haleakala Highway at 1,200-1,800m elevation. For the first time in October 1989, several roadside plants developed flowering stalks, which were removed. In late October 1989, a large individual of *Cortaderia* with flowering stalks over 3 m tall was sighted from a helicopter by National Park personnel just inside the Park boundary, at 2,010 m elevation, on the wall of Haleakala crater in Ko'olau Gap. Flowering stalks were destroyed by Park personnel in 1989. In July 1990, just prior to its flowering, the entire plant was destroyed (with great difficulty). The plant appeared large enough to have flowered in at least one year prior to 1989. In early 1992, seven seedlings were found and destroyed in the immediate area of Haleakala Crater. In the upper Kula area within 2 km of the large concentration which appears to have been the original seed source, at least 25 flowering plants of *C. jubata* have been established from seed. Another invasive population occurs adjacent to a nursery in the Olinda area. Cultivated plants of *C.jubata* also occur on several properties in the Makawao area. *Cortaderia selloana* occurs widely on Maui (e.g.Wailuku, Waihe'e), but we have thus far found only *C. jubata* in the 'upcountry area' of East Maui.

Based on literature on the species in California, *C. jubata* is most likely to thrive in Hawai'i in mesic, middle-to-high elevation sites not occupied by closed vegetation. It seems clearly capable of invading Haleakala Crater. Once established, the seedlings of *C. jubata* grow rapidly, reaching flowering size within 2-4 years, and become very large and very difficult to destroy. *Cortaderia jubata* should be classified as a 'noxious weed' under Hawai'i Administrative Rules and aggressively eliminated. Such an action should not involve excessive controversy since the similar, but non-invasive, species *C. selloana* is equally, if not more, attractive as an ornamental plant.

PRELIMINARY EVALUATION OF *CRYPHONECTRIA* SP. AS A BIOLOGICAL CONTROL AGENT FOR *MYRICA FAYA*

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University of Hawaii at Manoa
Honolulu, Hawaii 96822

INTRODUCTION

Myrica faya Ait. is a small tree native to the Azores, Madeira, and Canary Islands. It was introduced into the Hawaiian Islands during the late 1800's by immigrants from the Azores and Madeira and has since become established in disturbed forest areas, wastelands, pastures, and, in some cases, undisturbed forest areas where it competes successfully with native vegetation. It sometimes forms such dense stands that other vegetation is completely shaded out. The plant is considered to be a noxious weed and considerable effort has been expended to control it using mechanical and chemical means (Gardner and Kageler, 1982), but with only limited success.

Because *M. faya* is often closely associated with native vegetation, some of which is threatened or endangered, even effective chemicals often cannot be used. This has led to search for insects and pathogens which might be used as more host specific biological agents for control of the plant. In this regard several exploratory trips have been made to the Azores, Madeira, and Canary Islands (Krauss, 1964; Hodges and Gardner, 1985; Gardner et al., 1988) to look for potential biological control agents. During these trips, several pathogenic fungi were identified which were causing damage to *M. faya* in its native habitat.

In the earlier trips, made by entomologists F. A. Bianchi and N. L. H. Krauss between 1955 and 1962, two fungi were found in addition to the several insect species collected. *Ramularia destructiva* Phil. & Plowr. caused a shoot blight on *M. faya*, but no attempt was made to introduce the fungus into Hawaii. *Dothiorella* sp., also associated with a shoot blight, was found to be highly pathogenic to *M. faya* in studies conducted in Portugal (Azevedo, 1960). However, it was also found to be pathogenic to several economic fruit trees grown in Hawaii, and no further studies were made on this fungus.

During our trips in 1984 and 1987, these same two fungi were again observed. In addition, two other fungi, *Nectria galligena* Bres. and *Cryphonectria* sp., were found. Both fungi were associated with stem and/or branch cankers. *Nectria galligena* is a cosmopolitan species which causes cankers on a large number of fruit and forest trees, thus it is less likely to be a good candidate as a biological control agent. Although the *Cryphonectria* has not yet been identified to species (there is a possibility that it may be new), two other species of *Cryphonectria*, *C. cubensis* (Bruner) Hodges and *C. parasitica* (Murr.) Barr, are much more host specific and cause serious diseases on species of *Eucalyptus* and *Castanea*, respectively. For this reason, it was felt that further studies with this fungus were warranted. Unfortunately, plant quarantine regulations prohibit laboratory, greenhouse, or field evaluation of pathogenicity to *M. faya* and other plant species in Hawaii. The Biological Control Program was, however, able to obtain a small amount of space in the plant quarantine facility of the USDA Plant Disease Research Laboratory at Fort Detrick, Maryland. Because space was limited, it was possible to evaluate pathogenicity and host specificity only on small sections of freshly cut branch or stem segments of different plant species. This technique had been utilized previously with *C. cubensis*, and with one exception, it correctly identified the known field susceptibility of 13 tree species in the Myrtaceae (Hodges et al., 1986). The pathogenicity of *Nectria galligena* was also evaluated on *M. faya* and a few other species.

MATERIALS AND METHODS

Branch or stem sections, approximately 15 cm long and 2-4 cm in diameter, of *M. faya* and 16 other species of native Hawaiian and introduced tree species were collected in Hawaii, dipped in three percent hydrogen peroxide, the cut ends coated with melted paraffin, and shipped immediately to the plant quarantine facility at Fort Detrick. The sections were again dipped in three percent hydrogen peroxide and allowed to dry immediately before inoculation. Inoculum of the *Cryphonectria* sp. and *N. galligena* was grown on a commercial preparation of potato dextrose agar in Petri dishes. Inoculations were made by placing a piece of agar on which the fungus was growing in a wound approximately 1 cm square made 2 cm from one end of the section with a sterile scalpel: Five sections of each tree species were inoculated. Immediately after inoculation, the sections were placed in a plastic box containing moist paper towels to maintain high humidity--one plant species inoculated with one fungus in each box. Data on growth and development of the fungi were taken after 5 weeks incubation. Development of the fungus was determined by discoloration of the cambium.

The following is a list of the tree species inoculated:

Acacia koa A. Gray	Koa
Alnus rubra Bong.	Red Alder
Cheirodendron trigynum (Gaud.)Heller	Olapa
Coprosma montana Hillebr.	Pilo
Eucalyptus sp.	Eucalyptus
Ilex anomala Hook. & Arnott	Kawau
Juglans regia L.	English Walnut
Macadamia integrifolia Maiden & Betche	Macadamia
Malus sylvestris (L.) Mill	Apple
Metrosideros polymorpha Gaud.	Ohia
Myoporum sandwicense A. Gray	Naio
Myrica cerifera L.	Waxmyrtle
Myrica faya Ait.	Firetree
Myrsine lessertiana A. DC	Kolea
Psidium cattleianum Sabine	Strawberry Guava
Santalum sp.	Sandlewood
Sapindus saponaria L.	Soapberry
Sophora chrysophylla (Salisb.) Seem.	Mamane

RESULTS

Growth of *Cryphonectria* sp. on sections of the different species could be placed in five categories:

I. No growth. No evidence of fungus development was present in the cambium on nine species--koa, kawau, macadamia, mamane, ohia, pilo, sandlewood, soapberry, and strawberry guava. The cambium on all nine species remained alive during the course of the study, and all of strawberry guava and three of the sections of kawau were sprouting at the end of the study. The flap of bark above the inoculation wound was dead on all sections of all species. On strawberry guava, the fungus formed fruiting bodies on the surface of the dead bark flap on all five sections, on four of the five sections on macadamia, and on two of the five sections of kawau. No fruiting occurred on the sections of the other six species, although the fungus appeared to have developed on the inoculum piece in the wound.

2. Slight growth. Slight growth (5-10 mm) was made on at least some sections of four species. All sections of English walnut and kolea showed slight growth. The fungus was fruiting on the surface of the bark flap on all sections of kolea and on two sections of walnut. Slight growth was noted on two of five sections of red alder and one of five of apple, but no fruiting occurred.

3. Moderate growth. The fungus developed on all sections of waxmyrtle inoculated, with growth varying between 4-6 cm from the point of inoculation. The fungus was fruiting on the bark flap over the point of inoculation and up to 2 cm from the point of inoculation. One of the five sections of eucalyptus also showed fungus development 5 cm from the point of inoculation with fruiting over much of this area. No growth was evident on the other four sections, but fruiting occurred on the bark flap on two sections. The fungus grew about 2 cm on one of five sections of naio but no fruiting was observed. In addition, the cambium on one section was completely dead, but no fruiting was observed on the bark flap or over areas of dead cambium. No growth or fruiting was observed on the remaining sections.

4. Excellent growth. On firetree, the fungus grew to the end of all five sections from the point of inoculation (about 10-12 cm), and was fruiting up to 5 cm from the point of inoculation.

5. Anomalous results. The cambium completely died on all sections of olapa with no evidence of fruiting of the fungus, even on the bark flap. Cambial death on sections of this species is not believed to be caused by the fungus.

The cambium on all five sections of waxmyrtle inoculated with *Nectria galligena* was completely dead. Unlike *Cryphonectria*, however, no fruiting bodies of the fungus were formed on the inoculated sections, and it could not be determined with certainty that the death was due to activity of the fungus. On macadamia, however, four of the five sections showed evidence of fungal growth and the fungus formed perithecia on one section.

DISCUSSION AND CONCLUSIONS

The growth and fruiting of *Cryphonectria* on sections of firetree in this study does not give an indication of the virulence of this fungus on living trees, and thus its potential as a biocontrol agent in this respect. Inoculation of living trees growing under greenhouse or field conditions would be necessary to determine this. However, the study does indicate that the fungus is relatively host specific, which is another important characteristic of a good biocontrol agent. The study included 18 species in 17 genera occurring in 14 families. Of the 18 species of plants tested, the fungus did not grow at all on nine, and it grew very poorly on four additional species. Its growth on two additional species, naio and eucalyptus, is problematical, having made discernible growth on only one of five sections inoculated for each species. Good to excellent growth was made only on firetree, the original host of the fungus; and waxmyrtle, which belongs to the same genus. It is highly unlikely that the fungus would make better growth on living, intact trees than on stem and branch sections as used in this study. In fact, it is more likely that the fungus would not grow at all on living trees of any of the species tested, including those with only a few millimeters of growth, with the exception of firetree and waxmyrtle.

The death of olapa cambium on all of the sections during the incubation period is probably a natural condition for detached stem sections unrelated to inoculation.

This study indicates that pathological studies with *Cryphonectria* on firetree and other hosts could be undertaken under greenhouse and/or field

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conditions in Hawaii with minimal danger of the fungus spreading to nontarget hosts.

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MARCH PLANT OF THE MONTH: HAWAIIAN ARALIADS

Scot Medbury, Horticultural Curator
Honolulu Botanical Gardens

The native and naturalized flora of Hawai'i includes species in six Araliaceous genera. *Schefflera* and *Hedera* are represented by one species each: both are alien escapes. *Cheirodendron*, with five Hawaiian species, and *Reynoldsia*, with one native species, are indigenous genera also found elsewhere in Polynesia. The remaining two genera are endemic to Hawaii: *Tetraplasandra*, with six species (including *T. gymnocarpa* of O'ahu's Ko'olau range, which has been proposed for listing as an endangered species); and the monotypic genus *Munroidendron*, found only in three small populations on Kau'ai and noted for its long, pendulous inflorescence. Species of *Tetraplasandra*, as well as *Reynoldsia sandwicensis* and *Munriodendron racemosum*, may be seen growing side by side in the Wahiawa Botanical Garden. Some of these specimens are nearly thirty years old and are the result of the pioneering efforts by BOTSOC members John Obata and Paul Weissich in the cultivation of native plants of Hawai'i.

BOOK REVIEW

SHOREBIRDS: AN IDENTIFICATION GUIDE

Paper back Edition 1991. Peter Hayman, John Marchant, and Tony Prater. Houghton Mifflin Co., 1 Boston St., Boston MA 02108. 412 pp and 88 color plates. $24.95 paperback and $50.00 hardcover.

This identification guide is a natural companion to the previously-released book entitled "Seabirds: an identification guide", also from the same publisher. It is an indispensable reference for professional biologists, naturalists and serious birders, summarizing the field characters, habits and normal distributions for the shorbirds of the world.

The book is arranged according to family and covers all of the birds in the order Chardriiformes. Our only resident endemic shorebird, the Hawaiian Stilt (*Himantopus himantopus knudseni),* is treated as a race of the Black-winged Stilt in this field guide. Migratory shorebirds from several continents can also be found in the Hawaiian Archipelago, either regularly or as accidental, and this guide has excellent color plates for assisting in identifications. Shorebirds in general, and especially the many similar sandpipers (eg *Calidris*) are often difficult to identify in the field. This book has the best compilation of sexual, age-related, and seasonal plumages that I have yet seen.

Because positive shorebird identification often requires exact observations of minute plumage and size differences, detailed bird topography and terminology is illustrated at the start of the book. This is followed by a two-page discussion about shorebird conservation, emphasizing the worldwide destruction of species and loss of habitat that man has caused. The authors suggest that listing birds should not be regarded as an end in itself but that bird observers should try to put their observations to good use in the conservation of these species.

The bird color plates face the distribution maps so that an observer can immediately ascertain whether an identification is likely because of the bird's known distribution, or so unlikely as to necessitate a photograph and verification by other experienced birders.

The color plates are folowed by species accounts, which include references for those readers with unsated curiosity, Especially difficult species pairs or species groups are compared in a table at the end of the book.

I enthusiastically recommend this field guide to ornithologists and other serious students of natural history.

Nancy P. Morin

MOUNTAIN CLOUD FOREST MEETING

A symposium/workshop focussed on the hydrological and biological functions and importance of cloud forests is being proposed for **April 4-8, 1993.** A state-of-knowledge synthesis will be attempted, the threats to these valuable ecosystems will be assessed and some kind of program to protect them will be proposed. Scientists working in mountain forests who have a broad interest in their conservation and managers of these ecosystems are invited to apply for participation. Numbers must be limited in order to have effective working groups.

The meeting will be held on the island of Hawai'i and is being organized by the East-West Center, Environment and Policy Institute. Send expressions of interest and a brief summary of your cloud forest work to: Dr. Lawrence S. Hamilton, EAPI, East-West center, 1777 East-West Road, Honolulu HI 96848.

NEWSLETTER OF THE HAWAIIAN BOTANICAL SOCIETY
C/O DEPARTMENT OF BOTANY
UNIVERSITY OF HAWAII AT MANOA
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Newsletter Hawaiian Botanical Society

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December 1992

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Published by the Hawaiian Botanical Society, which was founded in 1924 to "advance the science of botany in all its applications, encourage research in botany in all its phases, promote the welfare of its members and develop the spirit of good fellowship and cooperation among them." Any person interested in the plant life of the Hawaiian Islands is eligible for membership. Information may be obtained from the Society, c/o Department of Botany, 3190 Maile Way, University of Hawaii, Honolulu, Hawaii 96822.

OFFICERS OF THE HAWAIIAN BOTANICAL SOCIETY 1992

Executive Council

President:	Timothy Motley (UH, Botany Department)
Vice-President:	Loyal Mehrhoff (Bishop Museum, Botany Department)
Treasurer:	Kevin Beach, (UH, Botany Department)
Secretary:	Benton Pang (UH, Botany Department)
Directors:	Isabella Abbott (UH, Botany Department) Leilani Pyle, (Bishop Museum,Botany Department)

Committees appointed by the Executive Council

Membership:	Donald P. Gowing (Bishop Museum, Botany Department)
Newsletter:	Editor: Fiona M. Norris (Bishop Museum, Botany Department)
Conservation:	Steve Montgomery (UH)
Science Fair:	Benton Pang (UH, Botany Department) Winona Char (Char and Associates)
Native Plants:	Clifford Smith, Chair, (UH) Ken Nagata, (Lyon Arboretum) Evangeline Funk, (UH) John Obata, (Bishop Museum) Art Medeiros, (Haleakala National Park).

* * *

MEMBERSHIP

The Society year is from 1 December through 30 November.

Regular Membership is $ 7.50 per year
Student membership is $ 4.00 per year
Family Membership is $10.00 per year
Life Membership (individuals only) is $150.00

Honorary and Life Members pay no further dues.

MINUTES OF THE MEETING OF 6 APRIL 1992

President Motley opened the meeting at 7.30 pm.

Guests for the evening were Lloyd Bensen, Patrick Connor and Al Koga.

Minutes

Minutes of the meeting of 2 March were read and accepted.

Treasurer's Report

The treasurer's report was read and accepted.

Matters arising from the executive committee meeting

President Motley informed the Society that the reading of the minutes and the Treasurer's Report was part of the Order of Business as stated in the Constitution of the Society.

New Business

Ron Fenstemacher of Ka Papa Lo'i o Kanewai brought in the Hawaiian mint, *Haplostachys haplostachya* or **honohono.**

Volunteers are required to provide snacks after society meetings. Please see any of the officers.

Judges at the State Science Fair on 8 April were Benton Pang and Winona Char. First place prizes in Junior and Senior sections are $50 check and a copy of the book *La'au Hawaii* by Dr Isabella Abbott. Second and third prizes in the Senior Division were donated by Char and Associates.

Secretary Pang announced the book signing reception for the new ethnobotany book *Lau'au Hawa'i* by Dr Isabella Abbott to be held in the Atherton Halau , Bishop Museum from 5.30-7.30 pm on Tuesday 7 April. Hawaiian food and demonstrations of Hawaiian crafts were planned. Members were invited to attend.

Larry Nakahara announced the listing of prohibited and restricted plants for Hawai'i. He asked the Society to submit their lists to the State Quarantine for review. He also announced the hearing on the revision of the rules for noxious weeds to be held on 7 April at 7 pm.

Dr. Montgomery of the noxious plant task force announced that they have already added 40 plants to the 50 proposed by the State.

Scientific Program

Vice President Mehrhoff introduced Richard Palmer, Ph.D Candidate in the Botany Department of the University of Hawaii. His talk was on *Delissea rhytidosperma* and *D. subcordata* or **haha** of the Campanulaceae. Of the 9 species described in the *Manual of Flowering Plants of Hawaii*, these are the only 2 species extant in the wild. *Delissea rhytidosperma* is a rare endemic pf Kaua'i in mesic forests and *D. subcordata* is now found only on O'ahu in the Ko'olau and Wai'anae Mountains. He brought in examples of the two species he is currently growing for his research.

Vice President Mehrhoff then introduced the Speaker of the Month, Dr Diane Ragone, Director of the Plant Conservation Center at the National Tropical Botanical Garden. She described the Center's focus and efforts in growing native Hawaiian plants for education, aesthetic and genetic resources. She brought **maile**,*Alyxia olivaeformis*, and **'ohai** *Sesbania tomentosa* for members to take home.

The audience spent some time talking to the speakers, looking at the **haha** and **honohono** and choosing their plants before retiring to the adjacent room for refreshments.
Respectfully submitted
Benton K. Pang, Secretary

* * *

MINUTES OF THE MEETING OF 4 MAY 1992

President Motley opened the meeting at 7.35 pm.
The introduced guest was Dr David Webb.

Minutes

Minutes of the meeting of 6 April were read and accepted.

Treasurer's Report.

The Treasurer's report was read and accepted.

Membership Committee

Five new members were nominated and elected: T.Blake Lance, HSPA; Patrick Conant; Dr. and Mrs A.L. Bogle; Steven Perlman and Phillip Thomas.

Science Fair Committee

The adjudicators, Benton Pang and Winona Char announced the awards.

Ist Place,Senior Division

An award of $50 plus a signed copy of *La'au Hawai'i* to Anna Ishikava of Kamehameha Schools for her project: Antibacterial testing and Isolation of components of *Asparagopsis taxiformis* (**limu kohu**).

2nd Place,Senior Division

An award of $25 donated by Char and Associates to Valerie Makino of Mililani High School for her project: An ancient cure for a headache.

3rd place,Senior Division

An award of $25 donated by Char and Associates to Alisa Kurosaki of Mc Kinley High School for her project: Antibacterial properties of **Noni**.

1st Place, Junior Division

An award of $50 and a signed copy of *La'au Hawai'i* to Shayna Sung of Waimea High School for her project: Developing a solar powered germination chamber.

New Business

The executive committee nominated Don Gowing for honorary membership of the Society in acknowledgement of his help and guidance within the Society. Dr Gowing was elected unanimously by written ballot at the meeting.

A symposium on Cloud Forests was announced (see Volume 31(1) page 15 for details).

Susan Miller requested that the Society sent letters to Senators and Representatives urging continued Federal support of the USFWS and National Parks.

An announcement reminded members of the proposed plant sale at the next meeting. Donations of plants were requested.

Scientific Program

Vice-President Mehrhoff introduced the Plant of the Month speaker, Tim Motley, who spoke about the genus *Labordia* (Loganiaceae). Also called **kamakahela,** this endemic genus of 15 species is closely related to *Geniostoma* a genus found in the Pacific, outside Hawai'i. One exciting species he showed was *Labordia triflora* found above Kaunakaka on Molokai This species, re-discovered by Joel Lau, had not been seen since the 1890's.

Speaker of the month was Dr Sy Sohmer, Chairman of the Botany Department at the Bishop Museum. He soke on the philippine Flora Project, the goals, the groups involved and its importance for plant conservation in the Philippines. This 10 year co-operative project between the Philippine National Herbarium and the Bishop Museum, will document the flora of the past and present. Phase one is the plant collecting phase under the direction of Dr Ben Stone and the Collections Management phase under the direction of Dr Domingo Madulid The third phase will be the writing of flora accounts. The emphasis of the project is to support the conservation of what remains of this critically threatened flora.

* * *

MINUTES OF THE MEETING OF I JUNE 1992

President Motley opened the meeting at 7.30 pm.
Introduced guests were Peggy Oyama and family, Andrew MacCartney, Paul Bernhardt and Frank and Dianella Howarth.

Minutes

Minutes for the meeting of 4 May were read and accepted.

Treasurer's Report

The Treasurer's report was read and accepted.

Membership Committee

James L. Ingamells and John McDonald were proposed and accepted as members of the Society.

Old Business

In response to a request by Susan Miller of the Natural Resources Defense Council, letters were sent to appropriate Congressional Senators and Representatives to request an increase in funding for the USFWS and National Parks Service.

New Business

The Sierra Club Legal Defense Fund notified the Society about a meeting, on 20 June at UH Manao Campus Center,.to discuss the State Office of Planning proposal on land use boundaries. The meeting was scheduled for 10 am -12 noon.

The Society received the following correspondence:

Thank you letters from recipients of the Society's awards at the Science Fair;
Brochure from Waimea Falls about upcoming events;
Source Directory for Native Hawaiian Plants compiled by the NTBG.

Notice was given of the Plant Raffle to be held after the meeting.

A special committee was nominated to accept the invitation from Dr Haunani Kay-Trask to tour the Kanewai Gardens.

Scientific Program
Vice-President Loyal Mehrhoff introduced the speaker for the Plant of the Month, John Obata, who spoke about the native Rhamnaceae of Hawai'i. Of special interest was his observations of the endangered *Gouania vitifolia* which has one plant left in the Wai'anae Mountains.

Ken Wood was Speaker of the Month. He talked about the rare and new species of plants of Kaua'i. Ken works part time for the National Tropical Botanical Garden and Hawaiian Plant Conservation Center as a field botanist pollinating rare plants on the steep cliffs of Kaua'i and collecting seeds. He showed many pictures of newly discovered, rare and endangered plants from the perspective of a mountain climber. His unique slides were enjoyed by the members present.

Plant raffle and refreshments followed the meeting.

NOTES ON WEEDS - VI

Clifford W. Smith
Botany Department
University of Hawaii at Manoa
3190 Maile Way, Honolulu HI 96822 USA

ASTERACEAE
Senecio madagascariensis
This weed is a new threat to Hawaiian ecosystems. It was first reported by a visiting biological control specialist from Australia, Dr. K. Harley. On Hawaii, it occurs along the upper road from Kamuela to Hawi from which it has already spread down as far as the road from Kamuela to Kawaihae. It appears that it is already

beyond normal control. On Kauai, it was found in a highway cut on the road to Puhi close to the junction to Koloa at a bridge widening project. It is suspected that it may have been a contaminant of the hydromulch that was used to stabilize the bank. This infestation appears to have been eradicated but people should be aware of it in case it escaped. Any sightings of an unknown yellow daisy should be reported to the Department of Agriculture office immediately.

It is a potential danger to livestock. The plant contains a toxic substance that can kill cattle. Fortunately, fresh plant material is distasteful and generally not eaten. However, if the plant is cut down and dried the repellant material is destroyed but the toxin is not.

MELASTOMATACEAE

Medenilla magnifica

Art Medeiros reports having seen two seedlings of this species on the banks of a cinder pit in Healani Gardens, Hana, Maui. This sighting is no clarion call to eradicate any plants that you see. I report it only because the presumed failure of *.M. magnifica* to reproduce in Hawaii has frequently been put forward as an argument against banning the further importation of all melastomes.

Miconia calvescens

This species has been in the news frequently this year. Betsy Gagné's recollections of the problem in Tahiti were vividly impressed on the conservation community in Hawaii by two posters. The most startling was its description as a "Green Cancer"; a description which subsequent information from Tahiti has confirmed. A consortium of concerned citizens and organizations on Maui put out an informal poster decribing the threat to the island's forests. A front-page article in the Maui News brought the problem to the attention of a much wider audience. As a consequence, Dr. Lloyd Loope, Haleakala National Park, who was acting as the chief organizer of the action committee received a number of tips of other localities from which the plant was known including one where someone had been unable to get the plant established, i.e., Iao Valley. A group of volunteers cleared Healani Gardens and adjacent properties of the original tree and several thousand seedlings. Dr. Loope presented a paper on the problem at the Pacific Science Congress in August. His presentation was followed by a very informative article in the Honolulu Star Bulletin. Another poster, professionally printed this time, was produced by State Department

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of Agriculture, Pest Control Branch. See the article "Melastome Action Committee"(below) for more information on proposed actions against this species.

Tibouchina herbacea
The spread of this species has been addressed in these Notes previously. The intensification of the infestation in several watershed areas has become a serious problem for the resource managers. The weed has since dispersed to pastureland where it is also spreading because cattle will not eat it. Late in 1990, the Resource Conservation and Development program on Maui decided to form a committee to discuss the problem and consider ways to counter the threat. Their initial focus was just on *T. herbacea* for which they coined the common name "cane tibouchina" because of its cane-like growth. See the article "Melastome Action Committee" (below) for more information on proposed actions against this species.

* * *

MELASTOME ACTION COMMITTEE

Clifford W Smith
Botany Department
University of Hawaii at Manoa
3190 Maile Way, Honolulu HI 96822 USA

Tibouchina herbacea has become a serious problem in the forest reserves of Maui and Hawaii. It has also begun invading pastureland where cattle avoid it. Late in 1990 the Tri-Isle Resource Conservation and Development program decided to establish a committee to discuss the problem, propose solutions, and try to find financial support for the management of the pest. The committee consisted of representatives of the following organizations:

U.S. Department of Agriculture
Resource Conservation and Development
Soil Conservation Service
Forest Service
U.S. Department of the Interior
National Park Service
State Department of Agriculture

State Department of Land and Natural Resources
Department of Forestry and Wildlife
University of Hawaii at Manoa Botany Department Cooperative Extension Service
The Nature Conservancy Hawaii
Maui Land & Pineapple Co.

At its first meeting, there was a lively discussion on whether the program should focus on cane tibouchina or on all melastome problems in the area. The *Miconia* problem was very much in the news. The lack of focus which might follow expanding the scope of the program was a concern as was the enormity of the problem of dealing with all melastomes. In the end it was decided to focus on the two major pests, cane tibouchina and miconia. At subsequent meetings a proposal "PREVENTING THE LOSS OF AGRICULTURAL AND FOREST RESOURCES BY CONTROLLING MELASTOME PLANT PESTS" was drafted for submission to the 1992 Hawaii State Legislature.

The report noted that melastomes have been introduced into Hawaii as ornamental plants since the turn of the century. By 1975, the problems created by Koster's Curse (*Clidemia hirta)* were so pervasive that the state initiated its first intensive control and research program against a member of this family. The species has since spread to all major islands. Three biological control agents have been introduced of which one is partially effective. Others are known but further work has not been conducted. Two other species, miconia and cane tibouchina, have recently caused considerable concern in conservation and forest management circles. Both species pose major problems to several segments of the state community because:

-the ranching industry is losing pasturage to cane tibouchina requiring the diversion of funds and personnel to its management;
-their continued expansion threatens future watershed management;
-all three species are among the most severe long-term threat to the continued existence of native forests, ecosystems, and their associated wildlife; and,
-a number of endangered species are threatened with extinction if any of these species invade their habitat.

Presently, extensive control programs by state and federal agencies, as well as private landowners, can only protect limited areas but do nothing to stop further infestations. No estimates have been made on the cost of controlling these species but it would be enormous. A long-term state-wide management plan is needed to halt the spread of melastomes and reverse their adverse impacts. Immediate management needs include the declaration of these species as noxious, an early warning system to identify and eradicate new infestations particularly when found on islands not already infested, support to foster government and volunteer eradication programs, and the initiation of a research program on their biological control.

The committee identified the following management and research needs:

-identify and map the distribution of all melastome species statewide;
-evaluate a control method using high density stocking;
-develop control methods suitable for small landowners;
-conduct exploratory research in the home environments of these plants for potential biocontrol agents followed by further screening of suitable agents in Hawaii;
-prepare educational materials for people affected by the weed.

For the first year, the committee proposes to:

-map the distribution of all melastomes in the Islands including horticultural plantings;
-determine the feasibility of biological control by sponsoring exploratory studies on three of the most threatening species;
-encourage the state to declare all melastomes as noxious species;
-evaluate the effectiveness of manual control as a feasible method for containment if not eradication;
-promote public awareness of the problems created by these pests; and,
-provide educational materials for affected groups.

The proposed cost of the first year of this project to the state would be $50,800 in FY92.

CURATORIAL UPDATE ON THE WORLD COLLECTION OF VASCULAR PLANTS IN THE HERBARIUM PACIFICUM

Keith P. Tomlinson
Department of Botany, Bishop Museum

During 1991 & 1992 several thousand new specimens were added to the world collection of the Herbarium Pacificum as a large backlog was processed. This project was made possible by a National Science Foundation facilities grant (BSR -89-12364). Over one hundred genera and six families were added to the existing collections. Many, but not all, of these new specimens arrived from the Pacific, Asia and Australia

Taxa from outside the Pacific and Asia include several valuable "region specific" collections from a variety of habitats. The largest of these collections come from various locations in South America. Representative specimens from the lowland tropics of Brazil, Ecuador, Venezuela, Peru and Colombia were included. In addition, several highland species were part of this material. Of particular interest are numerous ericad genera from Montane cloud forest and Paramo habitats in the Andes. A new family to the Herbarium, the Rhabdodendraceae, arrived with these collections.

A large and well documented collection from tropical Africa was also processed as part of the backlog. The vast majority of these specimens were from the equatorial west African nation of Gabon. While the tropics of Africa are recognized as floristically less complex than Asia or South America most of the specimens were not represented in our collections before this. Twentyseven genera new to our collections arrived as part of this material. Nearly all of these are endemic to the African tropics.

Our collection from temperate regions expanded as the backlog was processed. The largest component came from the former Soviet Union and included a broad spectrum of herbaceous flora from the Grassland Steppe of the western Ukraine and several new accessions of north temperate genera. Later in the year we processed another large European collection of herbaceous plants from the low Arctic of Scandinavia. Notable among these specimens were large collections of northern range Scrophulariaceae and Lamiaceae.

Specimens from the tropical Pacific, South East Asia and Australia were the largest additions to the world collection. Substantial collections arriving as gifts and exchange from Australia contained tropical and arid range taxa from that isolated flora including examples from the endemic family Davidsoniaceae. Predictably, rich collections of the Myrtaceae were part of this material too. Many additions of Australian *Eucalyptus* species have been added to the world collection.

Several excellent duplicate specimens have arrived from South East Asia. Particularly good material from Kalimantan, Sulawesi and various islands in the Banda Sea have provided many genera new to the herbarium. Similarly, new material from the Philippines has arrived. Most of these specimens come from the archipelago's northern islands of Luzon and Mindoro.

Accessions from the Pacific have been dominated by new material from the island of New Guinea. These collections come primarily from the work associated with the National Cancer Institute (NCI). NCI has sponsored several organizations to collect in tropical areas throughout the world in an effort to screen a large number of plants for potential medicinal use (Slack 1992). Research into anti-AIDS and anticancer compounds is the focal point of this program. Bishop Museum is the organization responsible for collections in Papua New Guinea. Collecting in Irian Jaya on the western half of the island is being conducted jointly by the University of Illinois at Chicago, Arnold Arboretum at Harvard University and the Herbarium Bogoriense in Bogor Indonesia. The Herbarium Pacificum is processing all material from Papua New Guinea. The Herbarium Pacificum is also receiving duplicates from the Irian Jaya collections.

The combined acquisition of these specimens has precipitated a complete reorganizaton of the herbarium's Melanesian collections. Formerly, these collections had been filed under the region recognized simply as 'Melanesia' which included the following island groups: New Guinea, Solomon's, New Caledonia, Vanuatu and Fiji. While maintaining the overall circumscription, our new filing system defines the herbarium's Melanesian collection more accurately from geographic and floristic perspectives. The new system will recognize three subregions within Melanesia. They will include: New Guinea (including the Bismark and Louisiade archipelagoes), New Caledonia (including the Loyalty Islands), Solomon Islands (including Bougainville), Vanuatu and Fiji. Genus covers will reflect these subdivisions.

The new system recognizes the complex and differing phytogeography of Melanesia as a region. The land area is approximately 958,000 square km. Just under 90% consists of the island of New Guinea (Brookfield & Hart 1970). Elevations range from sea level to over 4900 m in Irian Jaya and over 3950 m in Papua New Guinea. These high summits support the only alpine flora associated with equatorial glaciers in the Pacific basin (Hope et al. 1976). The region's exceptionally diverse topography, complex geology and tectonic history have fostered high rates of vascular plant endemism. Accordingly, the use of subregions within the herbarium's Melanesian collections will provide a more accessible and logical documentation of the region's complex physical geography and associated flora. Van Balgooy (1971) recognized 140 endemic genera in New Guinea and 95-100 in New Caledonia. These figures alone clearly warrants division of specimens from these two Melanesian islands. Moreover, this system is largely consistent with Takhtajan's (1986) floristic divisions of Melanesia, particularly with regard to New Caledonia.

The combined addition of all specimens brings the total world collection to just over 175,000 sheets. Particularly large additions have been made to the Poaceae, Rubiaceae, Anacardiaceae, Annonaceae, Myrtaceae, Euphorbiaceae and Sapindaceae.

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CENTER FOR PLANT CONSERVATION

CENTER FOR PLANT CONSERVATION REINTRODUCTION SYMPOSIUM
APRIL 20-22, 1993

The Center for Plant Conservation is holding a three-day symposium to review existing reintroduction and restoration policies to develop national guidelines for rare plant reintroductions and to develop a model policy on rare plant reintroductions. The goal of the symposium is to :

- Review current policies of various federal and state agencies, conservation organizations, and private corporations.
- Publish and publicly distribute the results of the workshops and the symposium.

This project is being guided by a Steering Committee, consisting of eleven individuals representing nine different agencies and organizations, at the federal, state, and private levels. The Steering Committee is reviewing the available policies, organizing the format and speakers for the symposium, and assisting with the editing of the proceedings of the symposium.

The expected results of the symposium will be a book of contributed papers, including national guidelines that can be used for reintroduction projects by agencies and organizations throughout the country.

If you would like to receive a registration form for the Rare Plant Reintroduction Symposium please complete the form below and return by **January 1, 1993** to:

Marie M. Bruegmann
Center for Plant Conservation
Missouri Botanical Garden
P.O. Box 299
St. Louis, MO 63166

NAME: ______________________________
AFFILATION: ______________________________
ADDRESS: ______________________________
____
____

INTEREST IN REINTRODUCTION: policy: _____ guidelines: _____
techniques: _____ mitigation: _____ biology: _____ case studies: _____
other: ______________________________________

Space is limited so please register early.

mmb - jfflyer

Missouri Botanical Garden
Post Office Box 299
St. Louis, Missouri 63166-0299
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NEWSLETTER OF THE HAWAIIAN BOTANICAL SOCIETY
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Native Plants: Clifford Smith, Chair, (UH)
Ken Nagata, (USDA, APHIS, PPQ)
Evangeline Funk, (Botanical Consultants)
John Obata, (Bishop Museum)
Art Medeiros, (Haleakala National Park).

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Life Membership (individuals only) is $150.00

Honorary and Life Members pay no further dues.

MINUTES OF THE MEETING OF 5 OCTOBER 1992

President Motley opened the meeting at 7.30 pm., and introduced guests Laura Flanagan, Alyce Ikeoka, and Mashuri Waite.

Minutes

The minutes of the meeting of 1 June were read and accepted.

Treasurer's Report

The Treasurer's report was read and accepted.

New Business

Nominating Committee: Benton Pang and Leilani Pyle, having volunteered, were appointed as the Nominating Committee and requested to report in November.

News of Interest to Members

Dr. S. H. Sohmer has been appointed Director of the Botanical Research Institute of Texas
Dr. Derral Herbst has left the US Fish & Wildlife Service and assumed duty with the U.S.Army Corps of Engineers..
Dr. W. H. Wagner has fully recovered after an arrhythmia attack at the AIBS meetings in August 1992.
The National Tropical Botanical Garden on Kauai lost about 10% of its collection to hurricane 'Iniki, but the propagation greenhouses remained relatively intact.
Dr. William Theobald of the NTBG is improving after a period in the rehabilitation hospital in Honolulu.
The U.H. Botany Department has T-shirts available at $10.00.

Scientific Program

Vice President Mehrhoff introduced Keith Tomlinson of the Bishop Museum Botany Department as speaker for the Plant-of-the-Month. He spoke on *Tillandsia utriculata*, and showed slides of this bromeliad in the Everglades National Park in Florida. It is a common component of the "hammock" communities there, and its stipes may grow one meter high.

Dr. Benjamin C. Stone, of the Bishop Museum, the Principal Investigator of the Philippines Flora Project was Spaker of the Month. After discussing the geology and climate of the islands, he described some of the botanical institutions there working jointly to develop a Manual of the Flora. He showed many informative slides, illustrating the several ecosystems included in the "Malesia" part of the islands,. and their representative species.

Respectfully submitted,
Benjamin K. Pang, Secretary

MINUTES OF THE MEETING OF 2 NOVEMBER MEETING

President Motley opened the meeting at 7:30 p.m., and introduced as guests Mashuri Waite and Tom Galato.

Minutes

The Minutes of the meeting of 5 October were read and accepted.

Treasurer's Report

The Treasurer's report was read and accepted.

Membership Committee Report

Two new members, Mashuri Waite and Vicki Caraway, joined the Society.

Nominating Committee Report

The Nominating Committee proposed the following officers for next year;

President-Sterling Keeley;
Vice President-Keith Tomlinson;
Treasurer-Ron Fenstenmacher;
Secretary-Benton Pang;
Directors-Leilani Pyle and Isabella A. Abbott.

There will be an opportunity for nominations from the floor at the Annual Meeting in December.

New Business

President Motley introduced a motion to change the meeting dates prescribed by the By-Laws The proposed change is o state that Regular Meetings will be on the second Monday in January and first Monday of the every other month except June, July, and August. The proposal was passed by the Executive Board and will be voted on by the membership during the December meeting.

A motion was passed to donate $100 to NTBG, tne National Tropical Botanical Garden, for repairs after Hurricane Iniki. It was asked that the Directors of the Neal/Miller fund be asked to match the $100 donation.

Announcement:
Due to repairs scheduled for Room #11 in St. John Hall, Society meetings from April to June 1993 will be held in Keller Hall,
Room #302 on the Manoa Campus.

Scientific Program

Dr. Loyal Mehrhoff introduced the Plant-of-the-Month , an unusual plant at Waimea Arboretum. The seeds were collected in the Panama rainforest and grown at Waimea. The inflorescence with unusual dark flowers is borne on a long peduncle that grows downward from the liana and opens at about 10 feet from the ground. Dr. Mehrhoff showed the Society slides of this interesting, but as yet unidentified legume (possibly a *Mucuna*), and brought in an inflorescence.

Heidi Bornhorst from the Nature Conservancy of Hawai‘i was the Speaker-of-the-Month. She highlighted some of the nature reserves of the Nature Conservancy, especially Honouliuli on O‘ahu and Lana‘i where she is Preserves Manager. Heidi spoke about the efforts of the Conservancy to manage these preserves through fencing, and the management of alien species, and (through a cooperative agreement with Lyon Arboretum) by propagation of the rare and threatened plants from the various preserves.

Refreshments were served afterwards.

Repectfully submitted,
Benton K. Pang

HAWAIIAN BOTANICAL SOCIETY
MINUTES OF THE ANNUAL MEETING, 7 DECEMBER 1992

President Motley opened the meeting at 7:30 p.m.

Secretary's Report
The minutes of the November meeting were read and accepted The Annual Report of the Secretary is appended below.

Treasurer's Report
The Treasurer's monthly report was read and accepted. His Annual Report is appended below.

Membership Committee
Chairman Gowing noted that there were three new life-members:

Dr. Ranjit Cooray, Dr. Donald Gardner, and Deborah Ward.

The paid-up membership roll now stands at 145, in the following categories:- 31 Life, 9 Honorary, 70 Regular, 15 Student, 16 Family and 4 Institutional memberships. We also provide 6 newsletter subscriptions free or on exchange.

Election of Officers
The slate of candidates that was recommended by the Nominating Committee in November was announced, and there were no further nominations from the floor. The quorum was verified, and the Offficers and Directors unanimously elected for 1993 were:

President - Dr. Sterling Keeley, U/H Botany Dept.
Vice President - Keith Tomlinson, Bishop Museum Botany Dept.
Treasurer - Dr. Ron Fenstemacher, Ka Papa Lo'i O Kanewai
Secretary - Benton Pang, U/H Botany Dept.
Directors - Dr. Dr. Isabella Abbott, U/H Botany Dept.
Leilani Pyle, Bishop Museum Botany Dept.

(The Editor of the Newsletter and the Chairman of the Membership Committee are *ex officio* members of the Executive Board, and the Past President has often served by invitation.)

Amendment to By-Laws
The change having been proposed in November, Art. II Sect 1 of the By-Laws was amended by unanimous vote:-

Substitute:-- "Regular meetings shall be held on the first Monday of each month where such Monday is not a legal holiday, except during the months of June, July, and August and except in January, when it will be held on the second Monday of the month."

Donation

On recommendation of the Directors, the Society voted unanimously to purchase 5 Department of Botany T-shirts as prizes to be given at the Audubon Society's environmental quiz show, "Paradise Pursuits".

Further Notes

Vice President Mehrhoff wanted the minutes to show that John Obata was wearing a cast on his wrist, injured on a hike (in line of duty)!

Dr. Palmer noted that the Neal/Miller fund matched the Society's contribution toward the expenses of repair of damages from 'Iniki at the National Tropical Botanical Garden on Kauai.

Scientific Program

President Timothy Motley gave a light-hearted Plant-of-the-Month talk, a review of his activities as President illustrated with slides, and also expressed his appreciation to the officers and members who assisted his administration of a successful Society year.

The Speaker-of-the-Month was Steven Perlman of the Hawai'i Plant Conservation Center at National Tropical Botanical Garden. He reviewed their program, noted the contributions of collectors Ken Wood and John Obata. The title of his talk was the "Effects of 'Iniki on Kaua'i's rare plants". His slides illustrated the tremendous destructive effects of the hurricane on the rare and endangered species. Some of them survived, but many of the previously known populations of growing specimens are now mostly or completely gone. Whether there will be any regeneration of these, naturally from seed, remains to be seen, but the rains since have caused severe erosion of the denuded areas, and land slippage and stream blockage. An unusual number of slugs were now seen in some areas, and greater rat damage than usual. The populations of pigs and goats were not noticeably reduced, but they did see dead birds and, as could be expected, the populations of weeds and alien plants were thriving, as was the case after hurricane 'Iwa of a few years ago.

In the discussion, it was noted that the hunting season had been closed on Kauai, which might be expected to increase the pressure from feral pigs and goats on the native flora. It was pointed out that interested groups could express their views at a meeting on 7 January 1993 at the Department of Land and Natural Resources where revisions of hunting rules and regulations are to be considered.

The meeting adjourned for refreshments at 8:45 p.m.

Respectfully submitted,
Benton K. Pang, Secretary

ANNUAL REPORT OF THE SECRETARY FOR 1992

The Officers, Directors, and the Committees active during the year are reported on the inside cover of the Newsletter.

Society Activities

The Society has written to, and been represented at, some meetings of government bodies whose operations affected the environment, native plants, and the control of alien plant pests. Our individual members have also been involved in hearings on such issues. We also supported the publicity for Earth Day, contributed toward repairs to the National Tropical Botanic Garden following 'Ininki, to the Audubon Society's environmental quiz show, and to the 35th Hawaii State Science and Engineering Fair. The Society furnished judges for the Science Fair awards in Botany, as reported in the minutes for April and May. The Society also held nine regular evening meetings, for which the programs are listed below.

Scientific Programs

In January, the Plant-of-the-Month speaker was Loyal Mehrhoff, discussing the reproductive biology of two rare lobeliad varieties. The Speaker-of-the-Month was Coleen Cory, on "Hummingbird Pollination at Wilson Botanic Garden, Costa Rica".

In Feburary, William Magruder was Plant-of-the-Month speaker, describing an unusually troublesome algal bloom off Maui. Bill Garnett of the Nature Conservancy was the Speaker-of-the-Month. He spoke on the Gardens and Botanical Recources of the Indo-Pacific.

For March, Scott Medbury of the Honolulu Botanical Gardens spoke for the Plant-of-the-Month on araliaceous trees at Wahiawa Botanical Garden. Kevin Beach of the U/H Botany Dept. was Speaker-of-the-Month on "Algal Succession on New Lava Flows"

April brought Richard Palmer (U/H Botany Dept.) as Plant-of-the-Month speaker, on his research with certain *Delissea* species and Diane

Ragone talked about propagating native Hawaiian plants at the Plant Conservation Center at NTGB, as Speaker-of-the-Month.

For May, Tim Motley discussed the genus *Labordia* for the Plant-of-the-Month. Dr. S. H. Sohmer of the Bishop Museum,as Speaker-of-the-Month, described the Philippine Flora Project

In June, Plant-of-the-Month speaker John Obata spoke on the native Rhamnaceae of Hawai'i, and Ken Wood of NTGB was Speaker-of-the-Month, describing his experiences in pollinating rare plants on the steep cliffs of Kauai.

October's Plant-of-the-Month speaker was Keith Tomlinson from Botany, Bishop Museum, describing *Tillandsia utriculata* in the Everglades. Dr. Benjamin C. Stone, as Speaker-of-the-Month, spoke on the ecological zones of the Philippines, and the plants therein.

In November, the Plant-of-the-Month was a mystery plant from Waimea Botanic Garden, described by Loyal Mehrhffof the Bishop Museum Botany Dept. Heidi Bornhorst was Speaker-of-the-Month, and she highlighted some of the nature reserves she manages for the Nature Conservancy of Hawaii.

At the Annual Meeting in December, President Tim Motley reviewed his year for "Plant-of-the-Month", and Steven Perlman of the Hawaii Plant Conservation Center at the National Tropical Botanical Garden told of the "Effects of 'Iniki on Kauai's Rare Plants' as Principal Speaker.

Newsletter

By mid-1992, Editor Fiona Norris had completed the two issues of Newsletter Vol. 30 (for 1991), and a cumulative index for Vols. 26-30 prepared by Donald Gowing was distributed as well. Two issues of Vol. 31 (1992) had been distributed by mid-December, and the third was in preparation.

Respectfully submitted,
Benton K. Pang, Secretary

TREASURER'S REPORT
for the year December 1991-November 1992

BALANCE IN HAND	$4311.99
INCOME	
Dues	1958.00
Interest	167.77
Donations	195.00
Miscellaneous (Reprints)	49.88
TOTAL	$2450.01
EXPENSES	
Postage and Photocopy	1231.40
Refreshments	69.08
Miscellaneous	428.33
Prizes	191.30
TOTAL	$1920.11
NEW BALANCE	$4841.89

NOTE ON PUBLICATION OF THE NEWSLETTER

The previous issue of the newsletter, Vol. 31(2), was properly so designated on the cover, but inadvertently printed as Vol 31(1) in the headers on the pages inside, instead of Vol 31(2). It was issued in mid-December of 1992.

This issue is designated Vol. 31(3/4) to complete the volume as of 31 December 1992, but is being printed and distributed in July, 1993.

SPOROBOLUS INDICUS R. Br. - NEW RECORD FOR KAHO'OLAWE

Steven D. Warren
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Environmental Division
P.O. Box 9005
Champaign IL 61826-9005

West Indian dropseed or smutgrass has recently been collected for the first time on Kaho'olawe. Prior to this discovery, *Sporobolus indicus* had been recorded within the Hawaiian Archipelago only on Hawai'i and Midway Atoll (Wagner et al. 1990).

The species was discovered along the northeast rim of the Lua Makika crater, near the highest point on the island (approximately 448 m above sea level) on 19 September 1990. The site lies within the area often referred to as the "hardpan". The hardpan occupies approximately one-third of the island, primarily at the higher elevations. The area is badly eroded and supports very little vegetative cover. Widely scattered individuals of tree tobacco (*Nicotiana glauca* R. C. Graham) Australian saltbush (*Atriplex semibaccata* R. Br.) and pitted beardgrass (*Bothriochloa pertusa* (L.) A. Camus) comprise most of the meager vegetation.

Identification of the specimen (Warren KAH-090-6) was verified by the curator of the S. M. Tracy Herbarium at Texas A&M University. The specimen has been donated to the B. B. Bishop Museum.

REFERENCE

Wagner, W. L., D. R. Herbst, and S. H. Sohmer. 1990. Manual of the Flowering Plants of Hawai'i. University of Hawaii Press and the Bishop Museum Press. Honolulu.

HAWAII'S ELUSIVE AKIA RUST

Donald E. Gardner

CPSU/UH Botany Department
University of Hawaii at Manoa
Honolulu, Hawaii 96822

Akia rust has been found only rarely since its discovery on *Wikstroemia uva-ursi* at Kapapala Ranch on the island of Hawaii by F. L. Stevens in 1921. J. C. Arthur, the prominent rust taxonomist, described the fungus, based on its uredinial state, as *Pucciniastrum wikstroemiae* in Stevens' 1925 publication Hawaiian Fungi (Stevens, 1925). The description, which included the statement "...epidermis rupturing irregularly and remaining overarched..." is interesting since in its current concept, the genus *Pucciniastrum* is characterized by a well-defined ostiolar opening rather than irregular rupturing of the tissue covering the uredinium (Cummins and Hiratsuka, 1983).

Aside from Stevens' material deposited at Bishop Museum as well as at Purdue University, I am aware of a specimen of akia rust at the USDA-APHIS Honolulu Airport reference collection, collected by E. T. Ozaki on *Wikstroemia* sp. in the Waianae Mountains of Oahu in 1963.

Because of its infrequent occurrence, and original description as one of the few (i. e., seven at Stevens' time; see Gardner, 1987) known endemic Hawaiian rusts, I have long been interested in finding akia rust. Over the years, whenever akia has been encountered, I have been self-programed to examine the leaves for indications of rust infection. I was successful in finding the rust along the Palehua-Palikea Trail in the Waianae Mountains in 1987, represented by a few uredinial pustules on the undersurfaces of the leaves of two or three small plants of *W. oahuensis*. This discovery of fresh material led me to examine the fungus closely and to compare it with previous herbarium collections. The fungus was characterized by prominent "capitate" paraphyses, and by uredinial pustules which opened by irregular rupturing. Paraphyses are sterile hairlike structures whose presence or absence is a common taxonomic feature among the Uredinales. However, capitate paraphyses are a distinctive form with a large, rounded tip and are found in relatively few rust genera. The presence of capitate paraphyses was particularly interesting, since the genus *Pucciniastrum* is defined as aparaphysate as well as ostiolate, as mentioned above.

According to notations at the Arthur Herbarium of Rust Fungi at Purdue University, Stevens' holotype material was personally examined by N. Hiratsuka, a noted authority on the genus *Pucciniastrum*. However, Hiratsuka made no mention of the capitate paraphyses. Hiratsuka prepared a monograph of the subfamily Pucciniastreae in 1936, in which he included akia rust among the species of *Pucciniastrum* for which the telial (perfect) state was not known (Hiratsuka, 1936). While it is possible that Hiratsuka's concept of *Pucciniastrum* in 1936 included a ruptured uredinium rather than a well–defined ostiole, it is difficult to understand how he could have overlooked the capitate paraphyses. His failure to note the presence of these structures remains a mystery. Since, according to current rules of nomenclature, a perfect genus should not be based on an imperfect state, such as the uredinial, Hiratsuka later transferred *P. wikstroemiae* to the form–genus *Uredo*, as *U. wikstroemiae* (Hiratsuka, 1958).

In consultation with the current curator of the Arthur Herbarium, Dr. Joe Hennen, I determined, based on our own comparison of the type specimen with the material I collected on *W. oahuensis,* that the Hawaiian rust on akia more closely fits the characteristics of the genus *Melampsora*, which has distinct capitate paraphyses resembling those which I had observed (Cummins and Hiratsuka, 1983). Consequently, the akia rust in Hawaii was referred to *M. yoshinagai*, a rust known from *Wikstroemia* hosts in the Philippines, Japan, Taiwan, and India (Gardner, 1988). This change meant that akia rust could be no longer considered endemic to Hawaii, only indigenous.

Notwithstanding these changes, the rarity of akia rust, together with the fact that the telial state has never been found in Hawaii, has led me to continue my search for this fungus.

A characteristic type of leaf damage occurs on *W. uva–ursi*, the species found most commonly along the hiking trails of the Kilauea region of Hawaii Volcanoes National Park (HVNP), and is probably the result of insect feeding, but has several times falsely raised my anticipation that the fungus may have been found. However, while examining shrubs of *W. uva–ursi* on the Crater Rim Trail of HVNP on September 2, 1992, I was successful in finding the rust on four plants growing in close proximity to each other. The reason for the occurrence of this apparent center of infection, with no sign of the rust on any of the other akia plants occurring quite commonly in the vicinity, is not known but is also not surprising based on my experience with other rust fungi.

Infection on one of the plants was notably plentiful, with many leaves bearing rust pustules on their undersurfaces, often with a corresponding yellow discoloration on the upper surface. Although not detracting from the success of this discovery, to my knowledge a new record for HVNP, it is unfortunate that no teliospores were found among the uredinia. It is possible that, whereas the telial state of *M. yoshinagai* is known elsewhere, akia rust survives in the isolation of the islands only in the uredinial state. A precedent for such reduced life cycles is well established by other Hawaiian rust fungi.

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NATIONAL TROPICAL BOTANICAL GARDEN

Press Release

Dr. Sherwin Carlquist, distinguished scientist, received the 1991 Allerton Award for excellence in tropical botany at an August symposium on diversity of Pacific Basin tropical woods. The bronze award was presented to Dr. Carlquist by Dr. David Lorence, NTBG systematic botanist, at a dinner at the Allerton Gardens, following the final day of symposium metings at the Sheraton, Poipu on Kauai.

Sponsored by the NTBG and representatives of the International Association of Wood Anatomists, this symposium brought together some 50 wood anatomists, foresters, and wood technologists from the Pacific Rim, Asia, Europe, and the United States. It was the first major scientific conference hosted by NTBG on Kauai. Researchers from the University of Hawaii, Institute of Pacific Forestry, USDA, and the U.S. Forest Service in Hawaii were among the participants.

Dr. Carlquist is an internationally renowned plant anatomist and specialist on island biology. His substantial contributions to these fields include over 160 research articles and papers and 7 texts--including Island Life, Island Biology, and Hawaii: A Natural History--which are often used for undergraduate and graduate courese at the University of Hawaii and other colleges and universities. Dr. Carlquist received his Ph.D. from the University of California, Berkeley. He has been a professor at Claremont Graduate School and Pomona College (CA) since 1961, and is a plant anatomist at the Rancho Santa Ana Botanic Garden and is a member of NTBG's Scientific Advisory Board.

The National Tropical Botanical Garden is a nonprofit research and education garden chartered by the U.S. Congress in 1964. Its permanent headquarters were established on the south shore of the Island of Kauai in 1970. The Garden's principal mission, the conservation and study of tropical plants, is realized through active collecting, research, education, and publications programs. Today this work is carried out at the NTBG's gardens and preserves on the Islands of Kauai, Hawaii, and Maui, and in South Florida.

NEWSLETTER OF THE HAWAIIAN BOTANICAL SOCIETY
C/O DEPARTMENT OF BOTANY
UNIVERSITY OF HAWAII AT MANOA
3190 MAILE WAY
HONOLULU HI 96822

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Newsletter Hawaiian Botanical Society

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Published by the Hawaiian Botanical Society, which was founded in 1924 to "advance the science of botany in all its applications, encourage research in botany in all its phases, promote the welfare of its members and develop the spirit of good fellowship and cooperation among them." Any person interested in the plant life of the Hawaiian Islands is eligible for membership. Information may be obtained from the Society, c/o Department of Botany, 3190 Maile Way, University of Hawaii, Honolulu, Hawaii 96822.

Officers of the Hawaiian Botanical Society 1993

Executive Council

President: Sterling Keeley (UH, Botany Department)
Vice-President: Keith Tomlinson (Bishop Museum, Education)
Treasurer: Ron Fenstemacher (Ka Papa Lo'i O Kanewai)
Secretary: Benton Pang (UH, Botany Department)
Directors: Isabella Abbott (UH, Botany Department)
Leilani Pyle (Bishop Museum, Botany Department)

Committees appointed by the Executive Council

Membership: Donald P. Gowing (Bishop Museum, Botany Department)
Newsletter: Editor: Gregory A. Koob (UH, Horticulture Department)
Conservation: Steve Montgomery (UH)
Science Fair: Benton Pang (UH, Botany Department)
Winona Char (Char and Associates)
Native Plants: Clifford Smith, Chair (University of Hawaii)
Ken Nagata (USDA, APHIS PPQ)
Evangeline Funk (Botanical Consultants)
John Obata (Bishop Museum)
Art Medeiros (Haleakala National Park)

Membership

The Society year is from 1 December through 30 November.

Regular Membership is $7.50 per year
Student Membership is $4.00 per year
Family Membership is $10.00 per year
Life Membership (individuals only) is $150.00

Honorary and Life Members pay no further dues.

Hawaiian Botanical Society Minutes

January 11, 1993

President Keeley began the meeting at 7 pm. New guests introduced were Brian Lym, Lisa Stratton, Tanya Leary, Daisy Holzmen, and Amy Eisenberg.

The Secretary's minutes for the December meeting were read and accepted. The annual report for 1992 was made available to the members for corrections or additions.

The treasurer's report was read and accepted

Membership chair Don Gowing renewed two institutional memberships and proposed one general membership for Alvin Yoshinaga.

Two announcements were made by the secretary: 1) Alaska Natural History Expeditions 2) Newsletter of the Friends of Halawa Xeriscape Garden. Both were made available to the membership after the meeting.

Plant of the month speaker was Dr. Loyal Mehrhoff, past vice president for the Hawaiian Botanical Society and research botanist at the Bishop Museum. He spoke on the endemic genus *Trematolobelia* and their status in Hawai`i today.

Betsy Gagné was the speaker of the month. The title of her talk was "The Vegetation Zones of Papua New Guinea". She showed the Society slides of the many plants and vegetation zones which were used in the past as part of an education curriculum in Papua New Guinea.

February 1, 1993

New guests: Tim Phillips and his wife Bridie.

Minutes of the January meeting were read and accepted.

Treasurer's report was read and accepted.

Membership chair Don Gowing proposed four new members: David Schneck, Anna Dixon, Deborah Woodcock and Brian Lym. He also proposed the family membership of Timothy Phillips and Bridie Jane Ridsdale.

Don also announced the passing of two long-time supporters of the Hawaiian Botanical Society, George O. Burr and Carl Spiegelberg.

New Business

Dr. Fiona Norris moved that Dr. Isabella Abbott be recognized for the Charles Reed Bishop Award she received from the Bishop Museum Board of Directors. This distinguished award was given to compliment her contribution to Hawaiian botany, work as a board of director for the Bishop Museum, G.P. Wilder professor of botany and author of La`au Hawai`i. The motion was passed by the membership.

Plant of the month was Dr. Fiona Norris on *Welwitschia mirabilis* an endemic plant found in the western plains of Africa. She described her "pilgrimage" to its native habitat and described the history of the taxonomy for this very unusual plant.

Speaker of the month was Keith Tomlinson, botanist at the Bishop Museum. He spoke on his field trip to the rain forests of Costa Rica. He described many of the plant species and illustrated the need for conservation in areas that are being disturbed due increased human population pressures.

March 1, 1993

President Keeley called the March meeting to order at 7:30 pm

New guest: David Brussel

Minutes of the February meeting were read and accepted. Treasurer's report was read and accepted. Membership chair Don Gowing proposed the family membership of the Howarth family.

Old Business

April and May meetings will be held in Keller #302

New Business

Please bring in your native plants in May for the annual plant raffle. Tickets will be $1 each.

The Hawaiian Botanical Society filed along with the Sierra Club Legal Defense Fund for an intent to sue for the listing of endangered species. The filing is in response to the long time it has taken the Kaua`i package of federally endangered species to become listed.

Plant of the month speaker was Benton Pang, graduate student in botany at the University of Hawai'i. Benton's talk was about the ethnobotanical uses of kauila (*Alphitonia ponderosa* and *Colubrina oppositifolia*). These two native genera of the Rhamnaceae provided Hawaiians with a valuable hardwood for many daily activities.

Speaker of the month was George Staples on the "progress and prognosis" of *In Gardens of Hawai`i II*. George explained the approach of the new *In Gardens* project and gave some of the latest results. Seventy-five percent of the book has been completed to date and he intends to have the book finished by early 1995.

Phytopathogenic fungi associated with fruits of pukiawe (*Styphelia tameiameiae*)

Brion K. Duffy and Donald E. Gardner

**Cooperative Park Studies Unit, National Park Service,
Department of Botany, University of Hawaii at Manoa,
Honolulu, Hawaii 96822.**

Pukiawe [*Styphelia tameiameiae* (Cham. & Schlechtend.)F. v. Muell., — Epacridaceae] is an endemic shrub which occurs in a diversity of habitats from the arid alpine to bogs and is particularly common in Hawai'i Volcanos National Park (HAVO). Although tree-like forms occur, pukiawe is usually compact, being 1-2 meters in height with woody stems and small, stiff leaves (Wagner et al., 1990). Inconspicuous white flowers, either perfect or unisexual, develop in the leaf axil (Neal, 1965). Fruits are globose drupes, dry and mealy around the seed, and range in color from red to white, often with flecks of deeper red (Wagner et al., 1990). Mature fruits remain attached as they dry and are found concurrent with developing fruits and flowers.

During a routine survey in HAVO, we observed small, black punctations (0.2 mm in diameter) on pukiawe fruits that were distinct from normal fruit markings. The punctations were determined to be fungal reproductive structures, termed pycnidia. The pycnidia contained many conidia (unicellular, ovoid, and hyaline) being produced on simple conidiophores. While the pycnidia were morphologically similar [dark, small, globose, and with an apical pore (ostiolate)] at least two forms could be differentiated based onconidial size. *Macrophoma* sp. had relatively large conidia (8 x 11 μm), while *Phoma* sp. had smaller conidia (5 μm in diameter). Pycnidia were immersed in the fruit flesh with a short beak penetrating the epidermis. In one case pycnidia of *Macrophoma* were observed on the seed.

To determine the incidence of these fungi, approximately

600 dry, attached fruits were collected from 25 plants (20-30 fruits per plant) growing along the Hilina Pali road and the Byron Ledge trail in HAVO. Observation with a stereomicroscope (45 X magnification) revealed 51.8% and 33.6% of all dry, attached fruits sampled from Hilina Pali and Byron Ledge, respectively, as having pycnidia. The two fungi were associated together on the same fruits with *Macrophoma* more common than *Phoma.*

There was also evidence of fruit infection by two other fungi. Erumpent black spots, termed acervuli, containing conidia characteristic of *Pestalotia* spp. were observed on a small number of fruits (<20) from both sites. Reproductive structures of *Botrytis* sp. were observed on a small number of fruits (<10) collected from the Byron Ledge site only. Identification of all fungi followed Barnett and Hunter (1972) and Sutton (1964).

Although the fungi described are generally considered parasitic on higher plants (Barnett and Hunter, 1972), pathogenicity of isolates from *Styphelia* could not be verified due to the inavailability of noninfested plants. Despite the widespread occurrence of these pathogens, it is improbable that any poses a serious threat to *Styphelia* since infection does not alter fruit appearance until after maturity and seed condition is not typically affected. Origins of these fungi, whether native or introduced, cannot reasonably be determined based upon available information. This isthe first report of any of these fungi on pukiawe (Raabe et al., 1981).

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Dieback of mamane (*Sophora chrysophylla*) and rat depredation

Brion K. Duffy and Donald E. Gardner.

Cooperative Park Studies Unit, National Park Service,
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The abundance and natural range of the native tree, mamane [*Sophora chrysophylla* (Salisbury) Seem. — Fabaceae] was greatly reduced over the last several decades by browsing activity of feral herbivores (principally goats, *Capra hircus*; sheep, *Ovis aries*; and Mouflon sheep, *Ovis musimons*), particularly in its montane habitat on Mauna Kea (Scowcroft and Giffin, 1983; Scowcroft and Sakai, 1983). Temporary control of these pests by the state greatly reduced their populations and was expected to result in regeneration of the mamane forest. While the vigor of the forest appeared to have improved in most areas on Mauna Kea, stands of mamane in other areas of Mauna Kea have experienced an unexplained decline for at least two years. Since the most extensive decline has occured near Pu'u Ahumoa and Pu'u La'au on Mauna Kea in the critical habitat of the palila (*Psittirostra bailleui*), an endangered native bird which depends upon mamane for survival, there is considerable interest in the elucidation of a causative factor.

As is typical of decline diseases (Manion, 1991), primary symptoms associated with mamane decline disease [generalized chlorosis, flagging (sudden death of isolated, prominent branches), and ultimately tree mortality] are ambiguous and offer few clues as to the origin of disease. A comprehensive survey of mamane populations on the island of Hawai‘i was initiated to ascertain the distribution of this particular disease and describe the general condition of these populations.

During a survey of mamane in an area of Hawai‘i Volcanoes National Park (HAVO) near the Ka‘u desert and the 34 mile marker on Highway 11 (Fig. 1) we observed evidence of depredation by rats (*Rattus* spp.) on dead trees and trees experiencing dieback of main branches. Many of the trees had suffered a severe loss of bark, excised new green shoots, and girdling of the main stem and branches.

A study site was established in this area to determine the extent of rat damage on mamane (Fig. 1). Trees were grouped in three size classes based on basal diameter of the main stem (<1, 1-4, and >4 cm.). Mamane can produce root shoots which are not easily distinguishable from seedlings. Therefore, in this study we considered an individual unit (tree) to be an isolated stem of any diameter not attached to another

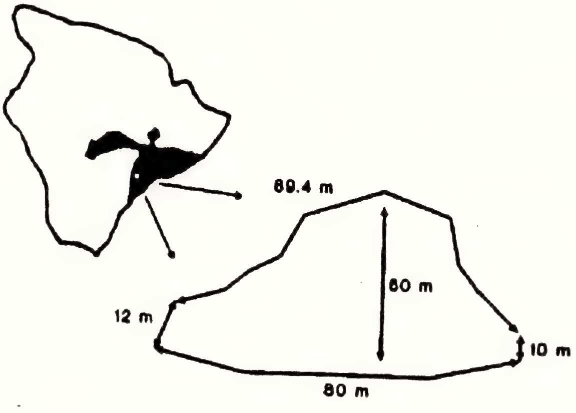

Figure 1. *Study site location within Hawai`i Volcanoes National Park (solid area) on the Island of Hawai`i, and dimensions of the site perimeter (inset).*

stem above the soil surface.

The severity of rat damage was rated on a scale of 0-4 where 0=no damage evident, 1=bark removed but no girdling of stems and branches, 2=bark removed with one main branch girdled and dead, 3=more than one main branch girdled and dead, and 4=tree dead presumably as a result of severe damage [extensive girdling of main stem(s)]. The severity of dieback of major branches, which could not reasonably be attributed to physical damage caused by rat depredation was assessed on a scale of 0-4 where 0=no dieback either on main branches or twigs, 1=dieback of twigs only, 2=dieback of twigs and one main branch, 3=dieback of more than one main branch, and 4=tree dead presumably as a result of an abiotic or biotic disorder(s). Trees that apparently died as a result of the combined effects of rat depredation and other sources [i.e., infectious disease or environmental factor(s)] were noted and damage from each source was given a maximum rating of 3 on the appropriate scale. Trees that had been dead for an extended period of time and on which evidence of depredation or other debilitating factor could not confidently be assessed were noted but not included in the analysis. Each individual unit within the study site was counted, its size determined, and the extent of canopy damage rated. The total number of trees was 419 with 237 in size class 1, 115 in class 2, and 66 in class 3.

Rat damage was observed on 74.5% of the trees with a small number of these being killed (17 in size class 1 and three in size class 2). Although damage was observed on trees of all sizes, smaller trees which had fewer resources available to compensate were most severely affected.

In addition to rat damage, however, 35.6% of the trees suffered damage and dieback from a different source. Ten trees died from such causes. Spreading cankers with pale-orange fungal fruiting bodies on the surface were observed on 7.9% of the trees and appeared most prevalent on trees in size class 3. The etiology of this canker and the identity of the associated fungus are currently under investigation. Damage is categorized according to tree size and severity in Table 1.

		Damage	
Tree size (Basal diameter)	N	Rat	Other
1 (cm)	237	1.54 ± 0.16	0.23 ± 0.10
2 (1-4 cm)	115	1.23 ± 0.19	0.97 ± 0.21
3 (4 cm)	66	0.95 ± 0.18	1.67 ± 0.31
All sizes[2]	419	1.38 ± 0.11	0.67 ± 0.10

[1] N=the total number of individuals observed for a given size group. Damage from rat depredation and other sources of dieback were measured on separate scales of increasing intensity from 0-4. For each category the mean rating is shown followed by the margin of error calculated with a confidence limit of 95%.

[2] All individual units were grouped, independent of size, for final analysis.

Table 1. *Damage and dieback on mamane caused by rat depredation and other abiotic factors.*[1]

Plants other than mamane within our study site included ohia trees (*Metrosideros polymorpha* — Myrtaceae), pukiawe (*Styphelia tameiameiae* — Epacridaceae), a'ali'i (*Dodonaea viscosa* — Sapindacaeae), and u'ulei (*Osteomeles anthyllidifolia* — Rosaceae) shrubs. Exotic grasses including *Andropogon* sp. and *Melinis minutiflora* dominated the understory. A'ali'i suffered from *Dodonaea* yellows disease (Borth, 1992; Borth et al., 1992) while the other species were apparently healthy. No damage caused by rat depredation was observed on ohia, pukiawe, or a'ali'i presumably because the bark of these plants is extremely course and rough.

Likewise, no damage was observed on *Osteomeles*, which has smooth bark similar in appearance, succulence, and texture to that of mamane, even when growing adjacent (as close as 25 cm) to heavily depredated mamane. A survey of *Osteomeles* in the Kapapala, Kalapana, and Hilina Pali areas of HAVO did not find any evidence of rat depredation on *Osteomeles*. To our knowledge rat damage has never been reported on *Osteomeles*.

Preference for mamane could explain the avoidance of *Osteomeles* which was observed. Results of Baker and Allen (1978) suggest that rats may prefer nectar, pollen, and seeds of *Hibiscadelphus* spp. because of the high levels of amino acids and other required nutrients these contain. Further, Baker and Baker (1973) have stated that leguminous plants typically have high levels of amino-acids in their nectar while members of the Rosaceae can have high to very low levels. Similarly, mamane, may contain high levels of nitrogen or sugar-based compounds in its bark rendering it superior to *Osteomeles* as a food source. Another possibility is that bark of *Osteomeles* contains one or more chemical compounds that are undesirable or even toxic to rats. The observation that ho'awa (*Pittosporum* sp.) as well as mamane was heavily depredated in a nearby area of HAVO but that *Osteomeles* again escaped damage supports the latter hypothesis. Controlled studies are needed to ascertain the basis for preference by rats of one plant species over another.

In summary, our results indicate the involvement of one or more abiotic or biotic factors in dieback of mamane. Further, the absence of extensive rat damage on mamane in other areas of its range, particularly on Mauna Kea, confirms the involvement of another factor(s) in mamane decline disease. Therefore, while rat damage may result in some mortality this threat to the greater mamane population is extremely limited. Further research is needed to ascertain the predisposing and causative factor(s) associated with mamane decline disease.

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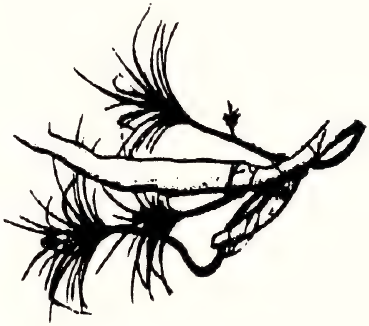
ʻIeʻie (*Freycinetia*) and drought

John Obata

Our society today is in constant demand for some sort of indicator or index to project various outcomes. Even among botanical circles, one senses a desire for such knowledge. Dealing with a statistical variable, an attempt will be made to address this problem.

The following discussion is based on observations from the early nineteen forties to finally getting a handle on the happenings of a few years ago. This was due in part to my preparing a paper outlining the demise of the Oʻahu tree snail (*Achatinella*). That's when suddenly all the pieces of the puzzle began to fit in place.



In the 1950s the sudden, partial demise of huge *Freycinetia* populations puzzled me. Especially when some of these populations house key *Achatinella* species. The frequencies of the demise was ingrained in me. Some of the populations which covered acres remain today only with struggling plants. The question of why there were the occasional demise of a population with a sudden resurgence after a few years intrigued me. Many mental conclusions were formulated in the past, but they will not be documented as it may be quite an embarrassment to this writer.

To simplify the discussion, it was noted that the *Freycinetia* populations were in a state of demise every decade since the 1940s. The rate started to accelerate from the 1960s. Regeneration seemed nil, but quite infrequently minor regenerations were noted. At first a biological answer was sought. None answered the question. Edaphic conditions were observed. The substrate was ruled out. Precipitation was analyzed. But how can one analyze something that is unpredictable in nature? But alas, one simple observation. After each periodic drought, *Freycinetia* populations deteriorated. After a season of rain, the populations showed a slight degree of regeneration.

The foregoing observations were universal whether the populations were found in drier forests of the Wainae Range of the wetter environs of the Koolau Range of O'ahu. Then it was my task to verify the results. All degraded populations of *Freycinetia* was preceded by a drought period of a year or two. Thus *Freycinetia* demise can be attributed to drought and not to senescence, as my original conclusion would have been.

Note from the editor

Dear Readers:

As some of you know the former editor (Fiona Norris) has moved on to other things. I will be taking on the responsibility of editing this newsletter.

I would like to ask of you several things to ease this transition. First, please write with your comments on the content and layout of the newsetter. (Be sure to let me know if you want your correspondence kept private.)

Second, please feel free to submit news items, articles or notes. General opinions, observations, scientific articles or press releases are all welcome.

Third, please bear with me while I attempt to get back on schedule with the newsletter. I will make it my goal to get it out on a regular basis.

Sincerely,

Gregory A. Koob

Editor

NEWSLETTER OF THE HAWAIIAN BOTANICAL SOCIETY
C/O DEPARTMENT OF BOTANY
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Newsletter

Hawaiian Botanical Society

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Published by the Hawaiian Botanical Society, which was founded in 1924 to "advance the science of botany in all its applications, encourage research in botany in all its phases, promote the welfare of its members and develop the spirit of good fellowship and cooperation among them". Any person interested in the plant life of the Hawaiian Islands is eligible for membership. Information may be obtained from the Society, c/o Department of Botany, 3190 Maile Way, University of Hawaii, Honolulu, HI 96822.

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Membership

The Society year is from 1 December through 30 November.

Regular Membership is $7.50 per year
Student Membership is $4.00 per year
Family Membership is $10.00 per year
Life Membership (individuals only) is $150.00

Honorary and Life Members pay no further dues.

Minutes for April 5, 1993

President Keeley called the April meeting to order at 7:30 PM. Minutes of the March meeting were read and accepted and the treasurer's report was read and accepted.

New Business

The Board of Directors has decided to draft a letter to Na Ala Hele condemning the damage to native plants due to recent trail clearings and increased mountain bike activity on Manoa Cliffs Trail.

Money was allotted to the Science Fair Committee for this year's awards.

The Hawaiian Botanical Society is selling Dr. Art Whistler's new books at a discounted rate for members. A sign-up sheet would be posted after the meeting.

Steve Montgomery requested $300 from the Neal-Miller Fund for Earth Day posters.

Please bring in your native plants in May for the annual plant raffle. Tickets will be $1 each.

Plant of the month speakers were Dr. Richard Norris on the red algae *Amansia* and Dr. Isabella Abbott on Gaudichaud's collection history of this plant.

Speaker of the month was Dr. Deborah Woodcock from the Geography department at UH Manoa. Her title was "Climate reconstruction based on biological indicators, with special reference to quarternary pollen and microfossil records". Dr. Woodcock talked about biological climate indicators such as percent leaf margin composition, tree rings, and wood structure in climate reconstruction studies. Refreshments were served after her talk.

Minutes for May 3, 1993

President Keeley called the May meeting to order at 7:40 PM.

Guest: Jonathan Scheuer, son of longtime member Dr. Paul Scheuer.

Minutes of the April meeting were read and accepted.

Treasurer's report was read and accepted.

New Business

Vice president Keith Tomlinson announced the deaths of Bishop Museum employees, Irene Swanson and Betty Suenaga.

Plant of the month speaker was Dianella Howarth, a senior at Moanalua High School and first place recipient in the State Science Fair and Hawaiian Botanical Society awards. She told the Society about her research in the native *Scaevola* in Hawai'i. In seventh grade she soaked *Scaevola* seeds in ocean water to yield insight to the arrival of the genus to Hawai'i. In high school her research discovered *S. gaudichaudiana* is found mostly on north and northwest facing slopes and she experimented with hybridization studies with *S. mollis*, *S. gaudichaudiana* and a hybrid. In her senior year she used molecular techniques on seven of the nine Hawaiian species.

Speaker of the month was Dr. Colin Bassett of the Hawai'i Conservation Biology Initiative. He described the mission of the organization, outlined its goals, its sponsors and some of the workshops supported. The collaboration of all the organization involved is necessary to provide support in research on Hawai'i's ecosystems, management, and training of both researchers and managers.

Checklist of the plants of Kaho‘olawe

Steven D. Warren and Stefanie G. Aschmann

US Army Construction Engineering Research Laboratory Environmental Division, PO Box 9005 Champaign, Illinois 61826-9005 and Pacific Division Naval Facilities Engineering Command Pearl Harbor, Hawaii 96860-7300

(Written, October 1991 — ed.)

It has been speculated that much of Kaho‘olawe was at one time covered with a dryland scrub forest similar to remnants of that ecotype presently found on Lana‘i (Zschokke 1932). Today, however, Kaho‘olawe is vegetatively depauperate. Approximately one third of the island is virtually denuded; the remainder is dominated by *kiawe* (*Prosopis pallida*), an introduced shrub, and a variety of introduced grasses and forbs. The only native species contributing significant biomass are *pili* grass (*Heteropogon contortus*), *ma‘o* (*Gossypium tomentosum*), *‘ilima* (*Sida fallax*) and *‘uhaloa* (*Waltheria indica*).

The demise of Kaho‘olawe began long before the arrival of European man. The cumulative effects of slash and burn agriculture practiced by the early Hawaiian people undoubtedly contributed to the loss of the scrub forest (Kirch 1982). Intense interisland warfare in the years just prior to the arrival of European explorers left the island “nearly over-run with weeds, and exhausted of . . . inhabitants” (Vancouver 1798). In 1779, the crew of Captain Cook described Kaho‘olawe as “barren”, “desolate” and an “altogether poor island” (Beaglehole 1967).

The same explorers that lamented the poor condition of the island unwittingly contributed to its further demise. Captain Cook and other early visitors introduced goats to the Hawaiian islands as gifts to native monarchy near the end of the 18th century. It has been speculated that some of the goats were subsequently placed on Kahoʻolawe (Sunday Advertiser 1912). Although numerous visits were made to Kahoʻolawe over the next half-century, the presence of goats was not actually recorded until 1850 (Perkins 1854). It is, therefore, difficult to discern the presence, abundance or effect of the animals prior to that time. Perkins (1854) characterized the island as "desolate in the extreme; the reddish, sterile soil being unrelieved by either tree or shrub." Despite the description, some trees and shrubs were present; Perkins described a grove of "akokoa shrubs" (probably *Chamaesyce multiformis* or *C. celastroides*) and a few stunted *wiliwili* trees (*Erythrina sandwicensis*), many of the former having died after being stripped of bark by goats. Some sizeable expanses of grassland were also present, at least on the lower slopes. Perkins mentions that they set fire to the grass as a signal to their companions, and that the fire burned for nearly a week, serving as a beacon to passing ships.

In 1858, William F. Allen sighted and killed a single goat, although he speculated that there were considerably more. Mr. Allen also reported to R.C. Wyllie, co-owner of a 20 year lease of Kahoʻolawe, that the island could support 20,000 sheep. The first sheep apparently arrived the following year (Wyllie 1859), beginning a series of ill-fated ranching enterprises. By 1875, there were approximately 20,000 sheep and several hundred goats present (Ka Lahui Hawaii 1875). Six years later, cattle were introduced (Hawaiian Gazette 1881), and by 1884 there were about 9,000 goats, 2,000 sheep, 200 head of cattle and 40 horses on the island (Bagot 1884).

Reports of livestock numbers varied over the next 25 years, but by 1910 it was apparent that they had exceeded the carrying capacity of the island, and for the first time specific mention was made of soil erosion (Hosmer 1910). In that same year the island was declared a Forest Reserve. Numerous forays were organized over the next 8 years to eradicate the livestock, but the goats and sheep persisted. There were also unsuccessful attempts to reestablish a woody vegetation (Hawaiian Gazette 1918a). Charles N. Forbes of the Bishop Museum visited Kahoʻolawe during this period and recorded a total of 16 native plant species and 15 introduced species (Forbes 1913).

By 1918, the economic demand for Kaho'olawe as a cattle ranch, coupled with the failed attempts to eradicate the goats, unsuccessful reestablishment of trees and the lack of funds to continue the effort, led the governor to withdraw Kaho'olawe from the Forest Reserve (Hawaiian Gazette 1918b). Cattle were reintroduced that year under the terms of a lease requiring the elimination of the goat population and steps toward reforestation. Over the next two decades, thousands of native and introduced tree seedlings were planted (Ashdown 1979) but with only limited success (Rice *et al.* 1932). In addition, several tons of native and introduced grass and forb seeds were planted (Ashdown 1979). Over 13,000 goats were either removed or shot. Despite the gallant efforts, the goats persisted in small numbers and great clouds of eroded dust continued to blow off the island (Judd 1938). In 1931, E.H. Bryan recorded 33 species of plants, adding 3 native species and 12 introduced species to the list recorded in 1913.

With the onset of World War II, the United States military subleased Kaho'olawe for training purposes. The cattle and horses were subsequently removed, but, in the absence of on-site ranch hands to control them, the small bands of sheep and goats reproduced rapidly. In 1953, President Eisenhower issued an Executive Order "reserving Kahoolawe...for the use of United States for naval purposes and placing it under the jurisdiction of the Secretary of the Navy..." until such a time as it might be "... no longer needed for naval purposes..." The Executive Order also required the Navy to "...eradicate from the island all cloven-hooved animals..." or limit their population to less than two hundred.

The direct effects of military use on the flora of Kaho'olawe have been minimal, and the Navy has instituted a highly successful program to eradicate the goats and sheep (Department of the Navy 1979). With the decimation of the sheep and goat populations, the vegetation has begun to show remarkable recovery. In 1978, a botanical survey revealed 106 plant species living on Kaho'olawe, including 27 endemic and indigenous species (Department of the Navy 1979). Two years later, 52 species, including 5 more natives, were added to the list (Corn *et al.* 1980).

In October 1990, President Bush issued an Executive Order temporarily discontinuing the use of Kaho'olawe as a weapons range and establishing a joint Department of Defense — State of Hawai'i commission to examine the future status of the island. Although the future remains unclear, interest is focusing on the condition and composition of the flora of Kaho'olawe. For that purpose, the following list has been compiled. We hope that the list will serve as a working tool for future visitors to Kaho'olawe. The list will undoubtedly grow as the flora continues to recover in the absence of the goat population and as more in-depth botanical surveys are undertaken.

Species that were reportedly once cultivated by early Hawaiians, but are no longer present on Kaho'olawe, are not included in the checklist. These species include sugar cane (*Saccharum officinarum*), sweet potatoes (*Ipomoea batatas*), yams (*Dioscorea alata*), gourds (*Lagenaria siceraria*), screw pine (*Pandanus tectorius*) and paper mulberry (*Broussonetia papyrifera*). Adventive species occurring only as trial plantings are not included. They will be the subject of a future paper.

The distributional status of each species as determined by Wagner *et al.* (1990) is listed as follows:

E	Species occurring naturally only within the Hawaiian Archipelago (*i.e., Endemic*).
I	Species occurring naturally within the Hawaiian Archipelago, but also known to occur naturally elsewhere (*i.e., Indigenous*).
P	Species of *Polynesian* introduction prior to the arrival of European man, and are now considered naturalized.
N	Species introduced to Hawaii after the arrival of European man, and are now thoroughly established (*i.e., Naturalized*).

Some endemic and indigenous species listed in the flora of Kaho‘olawe are considered by Wagner *et al.* (1990) to be extinct or threatened to some degree. The following categories are used to describe the degree of endangerment:

e	Species that are *endangered* to the point that survival is questionable.
r	*Rare* species at risk due to their limited distribution, but that are not currently endangered.
v	Species that are *vulnerable* due to loss of suitable habitat. These species may become endangered unless steps are taken to preserve them.
x	Species that are believed to be *extinct* throughout the Hawaiian Archipelago.
k	This category has been added by the present authors to indicate endemic, indigenous or naturalized species that have been recorded on Kaho‘olawe, but which they consider to no longer be present.

Sources of information are listed below. The *Manual of the Flowering Plants of Hawai‘i* (Wagner *et al.* 1990) is considered most authoritative since it is based primarily on plant specimens available in recognized herbaria. Botanical surveys by the U.S. Navy (1979) and Corn *et al.* (1980) included field identification as well as collections. The checklists by Forbes (1913), Bryan (1931) and Whitesell *et al.* (1971) were apparently based on field identifications only. In the absence of voucher specimens, some identifications may be questionable, particularly where the identified species are similar in appearance to related species known to occur on Kaho‘olawe. The species listed by Nahoalelua and Richardson (1857) and in Ka Lahui Hawaii were of casual mention only, but, nonetheless, add to the list of species which may have formerly occurred on Kaho‘olawe.

1	Wagner *et al.* 1990.
2	Department of the Navy 1979.

3 Corn *et al.* 1980.
4 Forbes 1913.
5 Bryan 1931.
6 Ka Lahui Hawaii 1875.
7 Nahaolelua and Richardson 1857.
8 Whitesell *et al.* 1971.

	Status	Source
Agavaceae		
Agave sisalana Perrine Century plant, sisal, *malina*	N	1
Aizoaceae		
Sesuvium portulacastrum (L.)L. Sea purslane, *ʻākulikuli*	I	1
Amaranthaceae		
Amaranthus spinosus L. Spiny amaranth, *pakai kukū*	N	1
Amaranthus viridis L. Slender amaranth, *pakai, ʻāheahea, pākaikai*	N	1
Nototrichium sandwicense (A.Gray)Hillebr. *Kuluʻī*	E	1
Anacardiaceae		
Mangifera indica L. Mango, *manakō, manakō meneke, meneke*	N,k	1
Apocynaceae		
Catharanthus roseus (L.)G.Don Madagascar periwinkle, *kīhāpai*	N	1
Araliaceae		
Reynoldsia sandwicensis A.Gray *ʻOhe, ʻohe kukuluaeʻo, ʻohe makai, ʻoheokai*	E,k	4
Arecaceae		
Cocos nucifera L. Coconut palm, *niu, ololani*	P	1

Asclepiadaceae

Asclepias curassavica L. Butterfly weed, bloodflower, *laulele, lauhele, nuʻumela, pua ʻanuhe*	N	1
Asclepias physocarpa (E.Mey.)Schlechter Balloon plant	N	1
Calotropis gigantea (L.)W.T.Aiton Crown flower, *puakalaunu*	N	3

Asteraceae

Acanthospermum australe (Loefl.)Kuntze Spiny bur, Paraguay bur, *kūkae hipa, ʻihi kūkae hipa, pipili*	N	1
Ageratum conyzoides L. *Maile hohono, maile honohono, maile kula*	N	1
Artemisia australis Less. Wormwood, *ʻāhinahina, hinahina, hinahina kuahiwi*	E	1
Bidens alba (L.)DC var. *radiata* (Schultz-Bip.)Ballard ex Melchert Spanish needle, beggartick, *koʻokoʻolau, koʻolau*	N	1
Bidens mauiensis (A.Gray)Sherff Spanish needle, beggartick, *koʻokoʻolau, koʻolau*	E	1
Bidens pilosa L. *Kī, kī nehe, kī pipili, nehe*	N	1
Centaurea melitensis L. Napa thistle, yellow star thistle	N	1
Cirsium vulgare (Savi)Ten. Bull thistle, *pua kala*	N	1
Conyza bonariensis (L.)Cronq. Hairy horseweed	N	1
Conyza canadensis (L.)Cronq. Horseweed, *lani wela*	N	8
Emilia coccinea (Sims)G.Don Flora's paintbrush	N	5
Emilia fosbergii Nicolson	N	1
Emilia sonchifolia (L.)DC Flora's paintbrush	N	3
Galinsoga parviflora Cav.	N	1
Gnaphalium purpureum L.	N	1

Purple cudweed		
Heterotheca grandiflora Nutt. Telegraph weed	N	1
Hypochoeris glabra L. Smooth cat's ear	N	1
Hypochoeris radicata L. Hairy cat's ear	N	1
Lipochaeta bryanii Sherff *Nehe*	E,x	1
Lipochaeta integrifolia (Nutt.)A.Gray *Nehe*	E	1
Lipochaeta lavarum (Gaud.)DC *Nehe*	E	1
Lipochaeta rockii Sherff *Nehe*	E	1
Lipochaeta succulenta (Hook.& Arnott)DC *Nehe*	E	1
Pluchea indica (L.)Less. Indian fleabane, Indian pluchea	N	1
Pluchea symphytifolia (Mill.)Gillis Sourbush	N	1
Sigesbeckia orientalis L. Small yellow crown-beard	N	1
Sonchus oleraceous L. Sow thistle, *pualele*	N	1
Synedrella nodiflora (L.)Gaertn. Nodeweed	N	1
Tridax procumbens L. Coat buttons	N	1
Verbesina encelioides (Cav.)Benth.& Hook. Golden crown-beard	N	1
Vernonia cinerea (L.)Less var. *parviflora* (Reinw.)DC Litte ironweed	N	1
Xanthium strumarium L. var. *canadense* (Mill.)Torr.& A.Gray Cocklebur, *kīkānia*	N	1
Zinnia peruviana (L.)L. *Pua pihi*	N	1

Bataceae

Batis maritima L. Pickleweed, *ʻākulikuli kai*	N	1

Boraginaceae

Heliotropium curassavicum L. Seaside heliotrope, *kīpūkai, nena*	I	1

Brassicaceae

Coronopus didymus (L.)Sm. Swinecress	N	1
Lepidium oblongatum Small Pepperwort, peppergrass	N	1
Raphanus sativus L. Wild radish	N	1
Sisymbrium altissimum L. Tumble mustard	N	1

Cactaceae

Hylocereus undatus (Haw.)Britton & Rose Night-blooming cereus, *pāniniokapunahou, pāpipi pua*	N	1
Opuntia ficus-indica (L.)Mill. Prickly pear, *pānini, pāpipi*	N	1

Capparaceae

Capparis sandwichiana DC Caper bush, *maiapilo, pilo, pua pilo*	E,v	1

Caryophyllaceae

Polycarpon tetraphyllum (L.)L.	N	1

Casuarinaceae

Casuarina equisetifolia L. Common ironwood, *paina*	N	1
Casuarina glauca Siebold ex Spreng. Longleaf ironwood, saltmarsh ironwood	N	1

Chenopodiaceae

Atriplex semibaccata R.Br. Australian saltbush	N	1

Chenopodium carinatum R.Br. Goosefoot	N	1
Chenopodium murale L. Goosefoot, *‘āheahea*	N	1
Salsola kali L. Russian thistle, tumbleweed	N	8

Convolvulaceae

Cressa truxillensis Kunth	I	1
Ipomoea cairica (L.)Sweet Ivy-leaved morning glory, *koali ‘ai, koali, koali lau manamana, kowali, pa‘ali‘i*	N	1
Ipomoea indica (J.Burm.)Merr. Morning glory, *koali ‘awa, koali ‘awahia, koali pehu*	I	1
Ipomoea pes-caprae (L.)R.Br. subsp. *brasiliensis* (L.)Ooststr. Beach morning glory, *pōhuehue, puhuehue*	I	1
Ipomoea tuboides Degener & Ooststr. Hawaiian moon flower	E	1
Jacquemontia ovalifolia (Choisy)H.Hallier subsp. *sandwicensis* (A.Gray)K.Robertson *Pā‘ūohi‘iaka, kākuaohi‘iaka, kaupo‘o*	E	1
Merremia aegyptia (L.)Urb. Hairy merremia, *koali kua hulu, kuahulu*	N	1

Cucurbitaceae

Cucumis dipsaceus Ehrenb. ex Spach Hedgehog gourd, teasel gourd	N	1
Momordica charantia L. Balsam pear	N	1
Sicyos pachycarpus Hook.& Arnott *Kūpala*	E	1

Cyperaceae

Eleocharis calva Torr. Spikerush, *kohekohe, pīpīwai*	I	1

Epacaridaceae

Styphelia tameiameiae (Cham.& Schlechtend.)F.v.Muell.
I,k 4
Pūkiawe, ‘a‘ali‘i mahu, kānehoa, maiele, maieli, puakeawe, puakiawe, pukeawe, pūpūkiawe

Euphorbiaceae

Chamaesyce celastroides (Boiss.)Croizat & Degener var. *amplectens* (Sherff)Degener & I.Degener E 1
Spurge, *‘akoko, koko, ‘ekoko, kōkōmālei*

var. *stokesii* (C.Forbes)Degener & I.Degener
E 1
Spurge, *‘akoko, koko, ‘ekoko, kōkōmālei*

Chamaesyce hirta (L.)Millsp. N 1
Hairy spurge, garden spurge, *koko kahiki*

Chamaesyce hypericifolia (L.)Millsp. N 2
Graceful spurge

Chamaesyce multiformis (Hook.& Arnott)Croizat & Degener var. *microphylla* (Boiss.)Degener & I.Degener
E 3
‘Akoko, koko, ‘ekoko, kōkōmālei

Chamaesyce prostrata (Aiton)Small N 1
Prostrate spurge

Chamaesyce skottsbergii (Sherff)Croizat & Degener var. *vaccinioides* (Sherff)Koutnik E,v 1
‘Akoko, koko, ‘ekoko, kokomalei

Chamaesyce thymifolia (L.)Millsp. N 4
Spurge

Euphorbia heterophylla L. N 1
Kaliko

Ricinus communis L. N 1
Castor bean, *pā‘aila, ka‘apehā, kamākou, kolī, lā‘au ‘aila*

Fabaceae

Acacia confusa Merr. N 1
Formosa koa

Acacia farnesiana (L.)Willd. N 1
Klu, aroma, *kolū*

Cajanus cajan (L.)Millsp. N 5
Pigeon pea, *pī nūnū, pī Pokoliko*

Chamaecrista nictitans (L.)Moench subsp. *patellaria* (DC ex Collad.)H.Irwin & Barneby var. *glabrata* (Vogel)H.Irwin & Barneby Partridge pea, *laukī*	N	1
Crotalaria incana L. Fuzzy rattlepod, *kūkaehoki*	N	1
Desmanthus virgatus (L.)Willd. Slender mimosa, virgate mimosa	N	1
Desmodium sandwicense E.Mey. Spanish clover, chili clover, *pua pilipili, kikania pipili*	N	1
Desmodium tortuosum (Sw.)DC Florida beggarweed	N	1
Desmodium triflorum (L.)DC Three-flowered beggarweed	N	1
Erythrina sandwicensis Degener *Wiliwili*	E	1
Glycine wightii (Wight & Arnott)Verdc.	N	1
Indigofera suffruticosa Mill. Indigo, *'inikō, 'inikoa, kolū*	N	1
Leucaena leucocephala (Lam.)de Wit *Koa haole, ēkoa, lilikoa*	N	1
Macroptilium lathyroides (L.)Urb. Wild bean, cow pea	N	1
Mimosa pudica L. var. *unijuga* (Duchass.& Walp.)Griseb. Sensitive plant, sleeping grass, *pua hilahila*	N	4
Prosopis pallida (Humb.& Bonpl. ex Willd.)Kunth Algaroba, mesquite, *kiawe*	N	1
Sesbania tomentosa Hook.& Arnott *'Ohai*	E,v	1
Sophora chrysophylla (Salisb.)Seem. *Māmane, mamani*	E	6
Tephrosia purpurea (L.)Pers. var. *purpurea* Fish poison, *'auhuhu, ahuhu, 'auhola, hola*	P	1
Vigna o-wahuensis Vogel	E,e	1

Gentianaceae

Centaurium erythraea Raf. subsp. *erythraea* Bitter herb, European centaury	N	1

Goodeniaceae

Scaevola sericea Vahl Beach naupaka, *naupaka kahakai, huahekili, naupaka kai*	I	1

Malvaceae

Abutilon grandifolium (Willd.)Sweet Hairy abutilon, *ma'o*	N	1
Abutilon incanum (Link)Sweet Hoary abutilon, *ma'o*	I	1
Gossypium tomentosum Nutt. ex Seem. Hawaiian cotton, *ma'o, huluhulu*	E,v	1
Hibiscus brackenridgei A.Gray *Ma'o hau hele*	E,e,k	1
Malva parviflora L. Cheese weed	N	1
Malvastrum coromandelianum (L.)Garcke subsp. *coromandelianum* False mallow	N	1
Sida fallax Walp. *'Ilima*	I	1
Sida rhombifolia L.	N	1

Myoporaceae

Myoporum sandwicense A.Gray Bastard sandalwood, *naio, naeo, naieo*	I,k	4

Nyctaginaceae

Boerhavia coccinea Mill.	N	1
Boerhavia glabrata Blume *Alena, nena*	I	1
Boerhavia herbstii Fosb. *Alena*	E	1
Boerhavia repens L. *Alena, nena*	I	1

Oxalidaceae

Oxalis corniculata L. Yellow wood sorrel, *ʻihi ʻai, ʻihi ʻawa, ʻihi maka ʻula, ʻihi mākole*	P	1

Papaveraceae

Argemone glauca (Nutt. ex Prain)Pope var. *glauca* Prickly poppy, *pua kala, kala, naule, pōkalakala*	E	1
Argemone mexicana L. Mexican poppy	N	4

Passifloraceae

Passiflora edulis Sims Passion fruit, purple granadilla, purple water lemon, *lilikoʻi*	N,k	2

Plumbiginaceae

Plumbago zeylanica L. Leadwort, *ʻilieʻe, hilieʻe, ʻiliheʻe*	I,k	1

Poaceae

Bothriochloa pertusa (L.)A.Camus Pitted beardgrass	N	1
Cenchrus ciliaris L. Buffelgrass	N	1
Cenchrus echinatus L. Common sandbur, *ʻumeʻalu, mauʻu kukū*	N	1
Chloris barbata (L.)Sw. Swollen fingergrass, *mauʻu lei*	N	2
Chloris divaricata R.Br. var. *divaricata* Stargrass	N	1
Chloris virgata Sw. Feather fingergrass	N	1
Cynodon dactylon (L.)Pers. Common bermudagrass, *mānienie, mānienie haole*	N	1
Dactyloctenium aegyptium (L.)Willd. Beach wiregrass	N	1
Dichanthium aristatum (Poir.)Hubb. Wilder grass	N	3
Dichanthium sericeum (R.Br.)A.Camus Australian bluestem	N	1

Digitaria ciliaris (Retz.)Koeler Henry's crabgrass, *kūkaepua'a*	N	1
Digitaria insularis (L.)Mez ex Ekman Sourgrass	N	1
Digitaria pentzii Stent Pangola grass	N	1
Digitaria setigera Roth Itchy crabgrass, *kūkaepua'a, mau'u kūkaepua'a*	I	7
Echinochloa colona (L.)Link Jungle rice	N	1
Eleusine indica (L.)Gaertn. Goosegrass, wiregrass, *mānienie ali'i*	N	3
Eragrostis cilianensis (All.)Link Stinkgrass	N	1
Eragrostis tenella (L.)P.Beauv. ex Roem.& Schult. Japanese lovegrass, *hākonakona*	N	1
Eragrostis variabilis (Gaud.)Steud. *Kāwelu, 'emoloa, kalamālō*	E	1
Heteropogon contortus (L.)P.Beauv. ex Roem.& Schult. Twisted beardgrass, tanglehead, *pili* grass, *pili, lule*	I	1
Melinis minutiflora P.Beauv. Molasses grass	N	1
Panicum fauriei Hitchc. var. *fauriei*	E	1
var. *latius* (St.John)Davidse	E	1
Panicum maximum Jacq. Guinea grass	N	1
Panicum ramosius Hitchc.	E	1
Panicum torridum Gaud. Torrid panicgrass, *kākonakona, hākonakona*	E	1
Panicum xerophilum (Hillebr.)Hitchc. *Kakonakona*	E	1
Pennisetum polystachion (L.)Schult. Feathery pennisetum	N	2
Rhynchelytrum repens (Willd.)Hubb. Natal redtop, Natal grass	N	1
Setaria verticillata (L.)P.Beauv. Bristly foxtail, *mau'u pilipili*	N	1

Sporobolus virginicus (L.)Kunth Seashore rushgrass, beach dropseed, *ʻakiʻaki, ʻaki, mahiki, māhikihiki, mānienie, mānienie ʻakiʻaki, mānienie māhikihiki, mānienie maoli*	I	1
Tragus berteronianus Schult. Burgrass, bertero goatgrass	N	1

Polypodiaceae

Christella dentata (Forssk.)Brownsey & Jermy Oak fern	I	3
Doryopteris decora Brack. Desert doryopteris, *ʻiwaʻiwa*	E	2
Nephrolepis sp. Schott	I	2
Pityrogramma calomelanos (L.)Link Gold fern	N	3

Portulacaceae

Portulaca lutea Sol. ex G.Forster Purslane, *ʻihi*	I	2
Portulaca molokiniensis Hobdy Purslane, *ʻihi*	E,r	1
Portulaca oleracea L. Pigweed, *ʻākulikuli kula, ʻākulikuli lau liʻi, ʻihi*	N	2
Portulaca villosa Cham. Purslane, ʻihi	E,v	1

Primulaceae

Anagallis arvensis L. Scarlet pimpernel, poor man's weatherglass	N	1

Rhamnaceae

Gouania hillebrandii Oliver	E,e,k	1

Rubiaceae

Coffea arabica L. Arabian coffee	N,k	1

Santalaceae

Exocarpos gaudichaudii A.DC *Hulumoa, kaumahana*	E,r	1
Santalum ellipticum Gaud. Coast sandalwood, *ʻiliahialoʻe*	E,k	1

Sapindaceae

Dodonea viscosa Jacq. *‘A‘ali‘i, ‘a‘ali‘i kū makani, ‘a‘ali‘i kū ma kua, kūmakani*	I,k	4

Solanaceae

Lycium sandwicense A.Gray *‘Ōhelo kai, ‘ae‘ae, ‘ākulikuli ‘ae‘ae, ‘ākulikuli kai, ‘ākulikuli ‘ōhelo*	I	1
Lycopersicon esculentum Mill. Tomato, *‘ōhi‘a lomi, kamako, ‘ōhi‘a, ‘ōhi‘a haole*	N	1
Lycopersicon pimpinellifolium (Jusl.)Mill. Currant tomato, *‘ōhi‘a ma ka nahele*	N	1
Nicotiana glauca R.C.Graham Tree tobacco, mustard tree, *mākāhala, paka*	N	1
Nicotiana tabacum L. Tobacco, *paka*	N,k	1
Solanum americanum Mill. Glossy nightshade, *pōpolo, ‘olohua, polopolo*	I	1
Solanum linnaeanum Hepper & P.Jaeger Apple of Sodom, thorny *popolo*, yellow-fruited *popolo, pōpolo kīkānia*	N	3

Sterculiaceae

Waltheria indica L. *‘Uhaloa, ‘ala‘ala pū loa, hala ‘uhaloa, hi‘aloa, kanakaloa*	I	1

Urticaceae

Neraudia sericea Gaud.	E,r,k	1

Verbenaceae

Lantana camara L. *Lākana, lā‘au kalakala, mikinolia hihiu, mikinolia hohono, mikinolia kukū*	N	1
Stachytarpheta dichotoma (Ruiz & Pav.)Vahl *‘Owī, oī*	N	8
Stachytarpheta jamaicensis (L.)Vahl Jamaica vervain, *ōwī, oī*	N	1
Verbena litoralis Kunth Vervain, *ōwī, oī*	N	1

Zygophyllaceae

Tribulus cistoides L. Caltrop, *nohu, nohunohu*	I	1

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New Information on the Cause of Yellows Disease of *Dodonaea* (*A'ali'i*)

Wayne B. Borth

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and

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Dodonaea viscosa Jacq. (*a'ali'i*) is an important plant in the dry forest and shrublands of Hawai'i, where it can be found from coastal dunes, through low elevation shrublands and dry, mesic, or sometimes wet forests to the subalpine shrubland near 2500 m on all the main islands except Kaho'olawe. The species is extremely polymorphic throughout is range which has led to many different classifications. Presently, the many different forms of a'ali'i in Hawai'i are considered as ecotypes or varieties of *D. viscosa* Jacq. (Wagner et al., 1990). With growth habits ranging from low shrubs less than a meter high, to trees of more than 10 m, this indigenous plant is important in Hawaiian ecosystems as a successful early colonizer of disturbed sites (Lamb, 1950; Mueller-Dombois et al., 1981). It can often be found growing on relatively new lava flows on the island of Hawai'i, where it is drought tolerant and able to provide a rich litter layer beneath its canopy which contributes to the formation of new soils on sites poor in organic material.

Gardner (1980), and later Gardner and Kageler (1984) reported a severe yellowing disorder of a'ali'i characterized by the proliferation of usually pendulous, chlorotic "witches' brooms" on sections of otherwise healthy plants. Terminal portions of these stems are often reddened and may be compressed laterally. Afflicted portions of plants fail to produce either male or female flowers while flowering appears normal on the nonsymptomatic portions of the same plant. The syndrome gradually spreads to involve the entire plant which eventually over a period of years becomes progressively defoliated with only a few deformed leaves remaining at the tips of the brooms. These plants ultimately wither but remain standing in the field where their clusters of dried leafless witches' brooms are prominent. Recovery of symptomatic plants has never been recorded in field situations.

At the time of its first report, the disease had been observed in both Hawaii Volcanoes (HVNP) and Haleakala National Parks, on the islands of Hawai'i and Maui, respectively. The disease was particularly obvious in the Mauna Loa Strip region of HVNP. Although at present only a small percentage of the native *Dodonaea* population is afflicted with overt symptoms of this disorder, it is slowly spreading to healthy a'ali'i in areas where it occurs; symptomatic plants now have been found on all the major Hawaiian islands. Individual *D. viscosa* plants may display symptoms of this disease at any point in their development. Mature individuals may develop symptoms on isolated branches, or young saplings may become entirely symptomatic within a short time after their establishment.

Two characteristics of this disorder suggest a pathogenic etiology. First, symptomatic plants can be found growing in different environments of rainfall, temperature, and substrate composition. Second, when plants with symptoms are transplanted into controlled environments, kept free from insects, and given regular applications of macro- and micro-nutrients, they retain their original symptoms. Thus, symptoms on afflicted plants are not caused by environmental factors, toxic substances associated with insect feeding, or poor soil or nutritional factors. Preliminary attempts to culture fungal or bacterial pathogens from symptomatic plants did not reveal any association between these agents and the disease syndrome.

We now have evidence implicating two potential pathogens associated with this disease in Hawai'i. One, a plant virus with particles 16 nm in diameter and 700 nm in length has been isolated from diseased *D. viscosa* but was not present in healthy plants (Borth et al., 1990). Similar types of viruses have been associated with serious diseases of pineapple in Hawai'i and of grapes in the eastern U. S.

The other pathogen is a mycoplasma-like organism (MLO). These prokaryotic single-celled organisms, too small for observation by light microscopy, have been known to cause disease in plants since 1967 when Japanese pathologists used transmission electron microscopy (TEM) to first document their presence in mulberry trees afflicted with mulberry dwarf disease (Doi et al., 1967). These workers also were able to obtain remission of symptoms by treating diseased plants with tetracycline antibiotics (Ishiie et al., 1967). This approach is now commonly used to treat plants suspected of having MLO infections (McCoy and Sinha, 1983). MLOs are vascular pathogens and only occur in the phloem tissues of plants. Presently, they are classified as obligate parasites of higher plants because they cannot be cultured in the absence of their host plants. They are commonly vectored by homopteran insects (leafhoppers, planthoppers, and psyllids) but are not seed transmitted.

At present, MLO diseases in hundreds of plant species representing 95 families have been reported worldwide (McCoy et al., 1989). As reported earlier (Gardner and Kageler, 1984), a relevant case occurs in the Mysore area of India, where sandalwood (*Santalum album*) is infected by an MLO that causes sandalwood spike disease. In that area, *D. viscosa* (which is native to India as well as to Hawai‘i) is a host for the sandalwood, and is affected by a yellows disease which seems in some ways similar to *Dodonaea* yellows disease in Hawai‘i (Hull et al., 1970; Nayar and Ananthapadmanabah, 1977). To investigate the possibility that MLOs are associated with *Dodonaea* yellows disease in Hawai‘i, symptomatic and symptomless a‘ali‘i plants sampled from field sites on the islands of Hawai‘i, Maui, and Kauai were tested with a nucleic acid probe prepared from the highly conserved 16S ribosomal gene of Western X MLO (the organism which causes a serious disease of cherries and peaches in the U. S.). This probe has been shown to reliably detect MLOs that cause disease in a wide range of plants. On all the islands sampled, 80% of the symptomatic plants and 33% of the symptomless plants growing near diseased plants tested positively with this probe. Leaves and roots of healthy plants grown from seed collected from symptomless a‘ali‘i did not react with this probe.

In addition, pleiomorphic bodies resembling MLOs have been observed in phloem tissues of diseased plants using TEM. Such structures were not observed in healthy plants grown from seed. Importantly, stem injections of oxytetracycline at 100 μg/ml alleviated brooming symptoms on diseased plants. Taken together, results of work with the molecular probes, TEM observations, and tetracycline applications confirm the involvement of MLOs with *Dodonaea* yellows disease in Hawai'i. Furthermore, the evidence suggests a complex etiology for the yellows disease which includes both viral and mycoplasmal agents. This is the first plant disease in the Hawaiian Islands for which MLOs have been shown to be involved.

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Dry Forest Species Under Semi-cultivated Conditions

Ron Fenstemacher

Ho‘okahe Wai Ho‘oulu ‘Aina Box 61494, Manoa, HI 96839

Ka Papa Lo‘i Kanewai is the Hawaiian cultural garden located on the makai side of Dole Street between the UH dorms and Kanewai field. Members of H‘okahe Wai Ho‘oulu ‘Aina, a non-profit corporation, created the garden as students in 1980. Within the garden are two basic categories of Hawaiian plant collections. There are the species introduced from the canoes of Polynesians such as taro, banana, sugarcane, *‘awa*, etc. These are the most obvious collections and the ones that initially draw most people to the garden. The second category comprises of endemic and indigenous species that were present when Polynesians arrived here; they are an attempt to re-create a native dry forest at Kanewai. This report is about several of those native species that have actually been vigorous enough to recruit at the garden.

In 1913, Joseph F. Rock remarked that the dry forest of Hawai‘i was botanically the wealthiest and most diverse of all Hawaiian forest because of the stunning array of species it held.[1] By 1988 it was estimated that less than 10% of undisturbed native forest remained on the four major islands combined.[2] Native lowland forests on O‘ahu are extirpated except for one area in the northern Wai‘anae mountains.[3] This incredible ecosystem's passing has yet to gain public attention like "rain forest" has. Many of Hawai‘i's most critically endangered plants are from this area.

Grim realizations such as the above have led to attempts to bring species from the native dry forest to Kanewai in order to observe them more closely. Initial planting material was hard to come by. As in nature, elements often combine to thwart efforts to restore ecosystems. Introduced arthropods and pathogens, aggressive weeds, development, etc., are all discouraging factors. Safe, commonly used pesticides and fertilizers can be toxic to native plants.

The revegetation program has been worthwhile nevertheless and yields many unique benefits. The successes and failures of the native dry flora at Kanewai afford hands-on experience and opportunities unmatched elsewhere in the University. The practical knowledge acquired at this dry site in such a remarkable laboratory setting is invaluable. It is possible to study the habits and life span of the 70 or so species there to evaluate characteristics used in taxonomy. The garden exposes every visitor to the rare and fragile beauty of the xeric flora of Hawai‘i in an easily accessible setting with minimal effort. The practical experience and tangible resources serve as a model for reforestation projects in dry places like Kaho‘olawe. The garden displays the potential of the xeric component of the flora of Hawai‘i to enhance landscapes with native plants pre-adapted to dry, leeward sites. These reasons among others make Ka Papa Lo‘i ‘o Kanewai an exceptional location for a dry forest of native plants.

Under the existing "tropical desert" conditions at the garden, of 35 to 40 inches of rain per year,[4] a few species volunteer and some actually seem to be spreading and establishing viable populations. A list of the native species[5] that have done this to date, with comments, follows:

1. *Achyranthes splendens* var. *rotundata* Hillebr.

This species grows well and has recruited in bare areas and beneath established plantings. It seems to have pioneer characteristics and is establishing a population. Its spread seems to be limited by competition by alien grasses.

2. *Bidens amplectens* Sherff

These *ko'oko'olau* are growing in soil about 20 cm deep above a layer of cement. Although close to water, this cement barrier creates a dry environment. Occasional efforts are made to minimize weeds. This species has established a stable population in the garden. It has acted as an annual in years past. With the wet summer of 1991 a few individuals survived a second year into 1992. With recent winter rain, new seedlings have sprouted.

3. *Chenopodium oahuense* (Meyen) Aellen

'Aheahea has pioneer qualities and has established a stable population at the garden. It seems limited by competition from alien grasses although it appears to be weedy itself. The leaves and tender tips make tasty greens.

4. *Cuscuta sandwichiana* Choisy

Kauna'oa appears with winter rains. It is spread by natural agents as it was never deliberately planted at the garden.

5. *Chamaesyce celastroides* var. *kaenana* (Sherff) O. Degener & I. Degener

This *'akoko* produces plenty of seeds, yet only two volunteers have ever been observed. This is quite curious considering the next entry.

6. *Chamaesyce skottsbergii* (Sherff) Croizat & O.Degener var. *skottsbergii*

This 'akoko produces many seeds and volunteers are pioneering areas. Well over 100 are presently at the garden. It is spreading and establishing a population. Its spread seems limited by alien weeds, although it is weedy itself. At times, a caterpillar denudes the plant of its foliage. The success of this species at the garden belies its limited distribution in nature.

7. *Erythrina sandwicensis* O. Degener

Wiliwili produces many seeds and volunteers frequently beneath established plantings.

8. *Abutilon incanum* (Link) Sweet

This species volunteers naturally in dry places. It is attacked by what seems to be a fungal rust. Individuals have survived dousing with herbicide.

9. *Hibiscus brackenridgei* A. Gray subsp. *brackenridgei*

Ma'o-hau-hele produces many seeds, but hand-pollination is sometimes necessary to assure seed set. Several have volunteered in bare places and beneath previous plantings. It is susceptible to disease problems that kill mature plants right at ground level.

10. *Sida fallax* Walp.

Several forms of the *'ilima* complex are at the garden. Some were planted deliberately, some not. They all regenerate freely. Plants have lately been attacked and killed by large numbers of mealybugs.

11. *Dodonea viscosa* Jacq.

'A'ali'i is one of the garden's most successful plants; not much bothers it. Staminate flowers predominate on both individuals past the juvenile stage at the garden with a few scattered pistillate flowers appearing late in the season. These pistillate flowers set viable seed since several volunteers have appeared, albeit slowly, beneath these individuals. The tardiness of volunteers is most likely an artifact of this large staminate/pistillate ratio.

12. *Solanum americanum* Mill.

Popolo appears with winter rains. It is spread naturally, as it never has been planted at the garden.

13. *Waltheria indica* L.

'Uhaloa is a common weed of disturbed places. It is dispersed naturally; in some areas of the garden it has become the dominant plant.

14. *Mariscus javanicus* (Houtt.) Merr. & Metcalfe

'Ahu'awa produces many viable seeds, yet only occasionally volunteers at the garden in wet areas. It seems susceptible to weed competition and perhaps disease also.

'Awa strainers were made from its flowering stalks by simultaneously squeezing and pulling the stalks between two round sticks repeatedly and drying the resulting fibers. This technique gently separates fibers from pulp, whereas pounding smashes and weakens the fibers. The 'awa strainer undergoes considerable stress being torqued as it is in making the beverage. The fibers need to maintain their integrity and be as sound as possible for long-lasting strength and durability.

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Addendum

The above article was written in early fall 1992. Beginning in October 1992 the University of Hawaii officially started to prohibit entry into the garden. Attempts were made by the University to move some of the dryland plants. Predictably, many died from transplant shock, overcrowded conditions, and subsequent neglect. In late June 1993, a third of the garden containing half of the dryland planting area was bulldozed. The University continues to restrict access to the whole garden. **RF**

Dr. Vladimir J. Krajina

Dieter Mueller-Dombois

Dr. Vladimir J. Krajina, Professor Emeritus at the Department of Botany, University of British Columbia and respected member of the Hawaiian Botanical Society, died June 1 this year at the age of 88 in Vancouver. Professor Krajina was born in Czechoslovakia where he studied botanical sciences at Charles University in Prague. He received his doctorate degree there in 1927 and became a faculty member in 1934. In the early 1930s he received a Bishop Museum Fellowship that brought him to Hawai'i, where he did taxonomic studies in *Cibotium*, *Gunnera*, *Pipturus*, and *Cheirodendron*. In 1934, Dr. Krajina became Associate Professor in geobotany and plant systematics at Prague's Charles University, following his habitation research on the plant communities in the High Tatra of the Western Karpatian Mountains.

During the Second World War, Vladimir Krajina became a leader of the Czechoslovakian Resistance Movement against German occupation. In 1943 he was captured, interrogated, and sent to the concentration camp Theresienstadt. At the end of the war he narrowly escaped execution. Right after the war, Krajina received recognition and high honors for his heroic war activities from the Czechoslovakian Government under President Benesh. He became the General Secretary of the Czechoslovakian Socialist Party after the first free post-war election. As a strong defender of democratic principles, Krajina soon came into conflict with the increasingly aggressive Communist Party. When the Communists took over in 1948, Krajina was wrongly accused of having collaborated with the Nazis. He fled the country with his family, wife Mary and two small children, and came via England to Canada in 1949.

He restarted his professional career in the Department of Botany at the University of British Columbia, where he began as a Special Lecturer. In 1951 he became Assistant Professor, in 1954 Associate, and in 1957 full Professor of Botany. He spent a year (1961-1962) as Visiting Professor at the University of Hawaii, where he gave lectures on vegetation ecology, wrote a paper on the "Biogeoclimatic Zones of the Hawaiian Islands" and produced a much used guide to the plants on the Manoa Campus.

In addition to teaching vegetation ecology, dendrology, and bryology at the University of British Columbia, V. J. Krajina devoted much of his energies to a field research program with graduate students that covered most of the forest regions of British Columbia. He was an inspiring teacher and attracted many students, 33 of them received higher degrees under his chairmanship between 1953 and 1977 (24 PhD's and 9 MSc's). A special symposium in honor of Professor Krajina's 80th birthday, organized by some of his graduate students, was published in the Canadian Journal of Botany Volume 66, 1988. It honors Krajina's life also for his special efforts and devotion to ecosystem conservation. His political skills paid off once more when he had convinced the Provincial Government, with the help of the then active International Biological Program, on the need to establish a system of natural areas as "ecological reserves". The British Columbia Reserves Act passed in 1971 with the legislative mandate to set aside natural areas as ecological reserves that should serve for:

- scientific research and educational purposes to study nature in an undisturbed environment;
- as benchmarks against which to measure the effects of change created by man or nature;
- as banks of genetic materials;
- and for preserving rare, unique, and endangered native plants and animals in their natural surroundings.

More than 100 ecological reserves have since been set aside in British Columbia. A distribution map and a list of the reserves was published with the 80th birthday Symposium honoring V. J. Krajina (Wali 1988).

A full record of his many written contributions was recently published by Prof. Jan Jenik (1992), with a more detailed account on Krajina's extraordinary life history as seen from the perspective of a professional colleague and former countryman. I can speak from the perspective of one of his many graduate students that he touched our lives deeply and permanently.

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Notes

New Plant Society on Big Island

In July the Hawaiian Botanical Society received a newsletter from the newly-formed Big Island Native Plant Society. The newsletter (Volume 1, No. 1, June 1993) included an introduction to the Big Island Native Plant Society, information on their first meeting, a weed tree alert, a listing of the endangered species of the Big Island, an events calendar, and a call for members.

The introduction in the newsletter reads as follows:

> **Welcome to the Big Island Native Plant Society!**
>
> In response to all of you who have expressed an interest in native Hawaiian plants, we proudly introduce the premier issue of the Big Island Native Plant Society newsletter.
>
> The rapidly growing public awareness of the ecological, scientific, and aesthetic value of the unique flora of the Big Island, and indeed all of Hawaii, has created a need for an organization that can bring together botanists, land managers, and interested plant enthusiasts. The creation of the Big Island Native Plant Society will unite these diverse groups into a single voice for native plant conservation and

provide a clearing house for the documentation and study of Big Island native plants.

In addition, members of the Big Island Native Plant Society will be active in preserving our island environment through educational programs, field trips, and volunteer work groups to remove noxious weed species that threaten native vegetation.

The Big Island Native Plant Society is a non-profit volunteer organization. Your involvement will make a difference. It is to you, our members, that we dedicate the Big Island Native Plant Society. Your energy and enthusiasm will be what makes the difference between the extinction or preservation of the Hawaiian flora. So, get involved! This is your native plant society.

Wishing you happy botanizing,

Dr. Rexford Palmer
(President, BINPS)
U.H. Hilo
Natural Sciences Dept.

Call for Nominations

It's once again time to nominate people as officers of the Hawaiian Botanical Society. The offices available are president, vice-president, treasurer, and secretary. If you would like to run for a position or would like to nominate someone as an officer please call Benton Pang at 956-3931 or write to:

Hawaiian Botanical Society
Attention: Benton Pang
c/o Department of Botany
3190 Maile Way
University of Hawaii
Honolulu, HI 96822

NEWSLETTER OF THE HAWAIIAN BOTANICAL SOCIETY
C/O DEPARTMENT OF BOTANY
UNIVERSITY OF HAWAII AT MANOA
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HONOLULU, HI 96822

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Newsletter
Hawaiian Botanical Society

Volume 32 (4) **December, 1993**

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Published by the Hawaiian Botanical Society, which was founded in 1924 to "advance the science of botany in all its applications, encourage research in botany in all its phases, promote the welfare of its members and develop the spirit of good fellowship and cooperation among them." Any person interested in the plant life of the Hawaiian Islands is eligible for membership. Information may be obtained from the Society, c/o Department of Botany, 3190 Maile Way, University of Hawai'i, Honolulu, HI 96822.

Officers of the Hawaiian Botanical Society 1993

Executive Council

President: Sterling Keeley (UH, Botany Department)
Vice-President: Keith Tomlinson (Bishop Museum, Education)
Treasurer: Ron Fenstemacher (Ka Papa Lo'i O Kanewai)
Secretary: Benton Pang (UH, Botany Department)
Directors: Isabella Abbott (UH, Botany Department)
Leilani Pyle (Bishop Museum, Herbarium Pacificum)

Committees Appointed by the Executive Council

Membership: Donald P. Gowing (Bishop Museum, Herbarium Pacificum)
Newsletter: Editor: Gregory A. Koob (UH, Horticulture Department)
Conservation: Steve Montgomery (UH)
Science Fair: Benton Pang (UH, Botany Department)
Winona Char (Char and Associates)
Native Plants: Clifford Smith, Chair (University of Hawai'i)
Ken Nagata (USDA, APHIS PPQ)
Evangeline Funk (Botanical Consultants)
John Obata (Bishop Museum)
Art Medeiros (Haleakala National Park)

Membership

The Society year is from 1 December through 30 November.

Regular Membership is $7.50 per year
Student Membership is $4.00 per year
Family Membership is $10.00 per year
Life Membership (individuals only) is $150.00

Honorary and Life Members pay no further dues.

Minutes for September 13, 1993

President Keeley called the September meeting to order at 7:30 p.m.

New Guest: Jason Adolf and Robert Pattison.

Minutes of the May meeting were read and accepted. The treasurer's report was held for the October meeting. Membership chair Don Gowing proposed the life membership of Joan Canfield.

New Business

Ron Fenstemacher shared a rare Hawaiian variety of banana called *hua moa*.

Dr. Keeley introduced the plant of the month speaker Dr. Loyal Mehrhoff of the U.S. Fish and Wildlife Service. He spoke on *Delissea undulata*, one of the endemic genera of Hawaiian lobelias. This species has one plant remaining in the wild, and that one is on Pu'uwa'awa'a Ranch. It was discovered by Jon Giffin, wildlife biologist, in 1992. It is the only extant subspecies of the three species described and by the slides shown of its degraded habitat, its survival looks tenuous.

Don Gowing introduced the speaker of the month, Mr. Ray Baker of the Lyon Arboretum. Ray spoke on significant palms of the Pacific. After speaking on the endemic Hawaiian pritchardias, he showed slides taken by Dr. Art Whistler of an unusual palm he found in the Cook Islands. This seems to be a new species of *Pritchardia*. The audience enjoyed Ray's vast knowledge of palms and many questions were entertained.

Minutes for October, 1993

President Keeley called the October meeting to order at 7:30 p.m.

Minutes of the September meeting were read and accepted. The Treasurer's report was read and accepted. Treasurer Fenstemacher voiced his concern over our low income. Even though we show a general fund of over $4,000, much of this is in escrow and tied up for life members. He mentioned the society needs to increase membership and/or raise dues, especially in the light of the recent backlogs of newsletters that will be updated in a couple of months. There was discussion about membership dues and creative ways of fund raising. Membership chair Don Gowing reported the recent passing of Victor Krajina in July and Dr. Raymond Fosberg in September. Dr. Mueller-Dombois will be presenting an obituary for Dr. Krajina and Dr. Fosberg for our newsletter. Don then proposed three new members: Jay Perry, Robert Pattison and Susan Cordell-Hart. All were accepted in the Society.

New Business

Dan Palmer, trustee for the Neal-Miller Fund has requested a new board member. The board has recommended the current treasurer, Ronald Fenstemacher, be an ex-officio member of the Neal-Miller Fund. A motion was passed.

Dr. Steve Montgomery informed the Society of the pig snaring controversy with The Nature Conservancy of Hawai'i (TNCH) and People for the Ethical Treatment of Animals (PETA). Conservation organizations are signing a petition drafted by Paul Scheur and TNCH supporting the use of pig snares as a means of protecting Hawai'i's unique and fragile environment. Dr. Montgomery, after reading the letter, asked that the Hawaiian Botanical Society co-sign the petition. After discussion and amendments to be added later, a motion was passed that President Keeley sign the petition for the Society. Dr. Montgomery also gave out posters depicting Hawai'i's native flora and fauna from the Conservation Council to the Society.

Nominating Committee — Secretary Pang was nominated by the board to chair the committee.

Hoya imperialis, the largest hoya in Malaysia, was shared at the meeting.

The Plant of the Month Speaker was Dr. Isabella Abbott of the botany department. Her talk was on gourds. She displayed various uses of gourds used by Hawaiians and other indigenous cultures.

Greg Koob, Phd candidate in horticulture and graduate assistant at Lyon Arboretum was the speaker of the month. He spoke on the micropropagation efforts currently underway at Lyon Arboretum. He discussed the methods being employed and the types of plants chosen for micropropagation. Micropropagation is yet another means through which botanists and horticulturists are cooperating to save Hawaiʻi's unique flora.

Minutes for November 1, 1993

President Keeley called the November meeting to order ar 7:45 p.m.

Minutes of the October meeting were read, amended, and accepted. The treasurer's report was read and accepted. Membership chair Don Gowing reported no new members for the month.

Old Business

Posters from the Conservation Council for Hawaiʻi were available after the meeting for a $2.50 donation each. The book *Wake of Dreams* is being sold for the Conservation Coalition of Voters for $20.00 each.

New Business

The press release announcing Dr. William Klein, Jr. as the new director of National Tropical Botanical Garden was read. The USFWS recovery plans for *Chamaesyce skottsbergii* var. *skottsbergii* and *Achyranthes splendens* var. *rotundata* and the Lānaʻi package were made available for public comment. A draft copy of the proposed amendments of chapter 124 of the Hawaiʻi Revised Statutes was made available for public comment.

Vice President Keith Tomlinson announced the speaker of the month, Steve Perlman of the Hawaiʻi Plant Conservation Center of the National Tropical Botanical Garden. Steve updated the Society on the effects and trends seen in the Kauaʻi flora since Hurricane ʻIniki. Although some plants seem to be coming back, many of the rare individuals and populations have gone extinct. With weeds taking over the island it is hard to estimate what really has been lost. Steve concluded his talk with the construction and revitalization of National Tropical Botanical Garden. While the Queen Emma cottage and Allerton house were totally destroyed, much of the garden and landscape has been brought back to its original state before the hurricane. Steve stimulated much discussion by botanists in the audience about specific populations of endangered plants on Kauaʻi and the effects of weeds on other rare plants populations that survived the hurricane.

Evaluation of the Rust Fungus *Phragmidium violaceum* in Chile for the Biocontrol of Prickly Florida Blackberry (*Rubus argutus*) in Hawai'i

George P. Markin

USDA Forest Service, 1643 Kilauea Avenue, Hilo, Hawai'i 96720

Donald E. Gardner

Cooperative Park Studies Unit, National Park Service Department of Botany, University of Hawaii at Mānoa, Honolulu, Hawai'i 96822

and

Hernán Norambuena M. and Rafael Galdames G.

INIA-E. E. Carillanca, Cassilla 58-D, Temuco, Chile

In Hawai'i the introduced prickly Florida blackberry, *Rubus argutus* Link (also referred to in the literature as *R. penetrans* L. H. Bailey), is widely distributed between 3,000 and 6,000 ft. (920-1,840 m) on most islands (Gerrish *et al.*, 1992). It is considered a nuisance weed in pastures, but outbreaks can also occur in forests, typically following disturbances such as road building, logging, or canopy opening following a hurricane. An earlier effort at controlling this bramble using biocontrol approaches was made in the 1960s and resulted in the establishment of three insects that, unfortunately, have had limited impact on blackberry in forest environments (Nagata and Markin, 1986). In several other locations around the world, introduced species of blackberry have escaped from cultivation and become pests. Two of these were introduced to Chile during the 1800s: *R. constrictus* Lef. & M., of central European origin and *R. ulmifolius* Schott., from the Mediterranean region (Oehrens, 1977). Both species reportedly have been successively controlled by introduction of the rust fungus *Phragmidium violaceum* (Schultz) Wint. from Europe (Oehrens and González, 1977). Subsequent introduction of this rust into Australia has provided partial control of another related blackberry, *R. fruticosus* L. agg. (Bruzzese and Field, 1985).

During several visits to southern Chile between 1988 and 1991, the senior author observed the presence and impact of this rust on the introduced blackberries. It was also noted that in experimental planting of commercial *Rubus*, the disease was never found on introduced species of raspberries. The question therefore occurred, if this rust were imported to Hawaiʻi, would it be a suitable control agent for our introduced species of blackberry, yet also be specific enough so as not to attack the two native Hawaiian species of raspberry (*R. macraei* Gray and *R. hawaiensis* Gray)?

A cooperative study was implemented with the Chilean Agricultural Research Department, Instituto de Investigaciónes Agropeculiaris (INIA), to test the susceptibility of the Hawaiian species of *Rubus* to the strain of *P. violaceum* used for biocontrol in Chile. In the summer of 1990, rooted cuttings of the pest *R. argutus*, and of the two native species were established with the use of air layers. After being tested for nematodes and pathogens, they were hand-carried to Chile where they were potted in a greenhouse at the INIA agricultural station near Temuco, in the sourthern part of the country where rust-infected blackberry is readily available. Our original plan had been to place the potted plants in the field among infected plants, but fear among local agricultural officials that our plants may escape and become established constrained us to confine our tests to a greenhouse.

Most of the plants transported to Chile readily took root in the pots and within 2 months were growing vigorously enough that testing could begin. Two methods of exposing the plants to the fungus were used: (1) Infected leaves from *R. constrictus* were rubbed on leaves of the Hawaiian plants; and (2) rows of potted Hawaiian plants were arranged downwind from bouquets of infected *R. constrictus* foliage, and a fan was used to convey the naturally released spores onto the Hawaiian plants. This method was an attempt to simulate the natural dispersal of the rust, the spores of which are wind-borne. Control plants of locally-obtained uninfected *R. constrictus* were used to determine the effectiveness of the inoculation methods. The study was conducted during the Chilean summer months of January through March, 1991.

The results have been published in a South American journal (Norambuena *et al*., 1992). Whereas control *R. constrictus* plants became infected, no infection was found on the two native Hawaiian species of raspberry. Unfortunately, the rust also failed to infect the target weed *R. argutus*. While the test was negative, it put to rest the question as to whether the strain of *P. violaceum* used in Chile and Australia as a biocontrol agent might be suitable for our use in Hawai'i. Even though this rust did not appear capable of infecting our introduced blackberry, it is possible that other strains or species of *Phragmidium* from Europe, or the eastern U. S. where prickly Florida blackberry is native, may show more promise in biocontrol. The rust fungus *Gymnoconia nitens* (Schw.) Kern & Thur. from the southeastern U. S. is known to attack *R. argutus* and is currently under investigation as a potential biocontrol agent (D. Gardner and C. Hodges, unpublished data).

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Nagata, R. F., and G. P. Markin. 1986. Status of insects introduced into Hawai'i for the biological control of the wild blackberry *Rubus argutus* Link. Proc. 6th Conf. Nat. Sci., Hawaii Volcanoes National Park, 10-13 June 1986. pp. 53-64.

Norambuena, H., G. P. Markin, D. E. Gardner, and R. Galdames. 1992. Estudios de especificidad del hongo *Phragmidium violaceum* (Schultz) Winter sobre *Rubus* presentes en Hawaii. Agro Sur 20(2):117-123.

Oehrens, E. 1977. Biological control of the blackberry through the introduction of rust, *Phragmidium violaceum,* in Chile. FAO Plant Protection Bulletin 25:26-28.

Oehrens, E., and S. M. González. 1977. Dispersión, ciclo biológico y daños causados por *Phragmidium violaceum* (Schultz) Winter en zarzamora (*Rubus constrictus* Lef. et M. y *R. ulmifolius* Schott.) en las zonas centro-sur y sur de Chile. Agro Sur 5:73-85.

Banana Find

Ron Fenstemacher

Ho'okahe Wai Ho'oulu 'Aina, Box 61494, Mānoa, HI 96839

On 31 July 1993, a *moa* or *hua moa* banana which had just fruited was found in upper Makaua Valley. Hua moa means chicken egg in Hawaiian. It has this name because of the remarkable shape of the fruit, the diameter almost equals the length, thus resembling an egg. It is a *pōpō'ulu* type of banana. The other two types of bananas that Polynesians brought with them are the *iholena* and *maoli*. The hua moa banana can be identified vegetatively from the longer than normal petioles and the tendency to hold more leaves in its crown than usual. The trunk is also tapered.

The tree was about two meters tall when the fruit was harvested on 11 September 1993. The bunch had three hands of three fruit apiece. The fruit doesn't get soft all the way when ripened like a dessert banana because it is so thick. However, it is a choice banana for cooking.

New Director for National Tropical Botanical Garden

Dr. William McKinley Klein, Jr. has accepted the position of Director of the National Tropical Botanical Garden

Dr. Klein has served as Director of Fairchild Tropical Garden (Miami) since March 1991. Before that he was director of Morris Arboretum at the University of Pennsylvania for 13 years and assistant director at the Missouri Botanical Garden for six years.

His extensive professional experience includes both research and university teaching. This year he received the American Horticultural Society's Professional Award for his role in the recovery of the Fairchild Garden after Hurricane Andrew, as well as his achievements in public garden administration.

Douglas McBryde Kinney, Chairman of the Garden's Board, speaking in behalf of NTBG's Trustees said, "We are delighted that Dr. Klein has accepted the position of Director of the National Tropical Botanical Garden. With over 20 years of managing scientifically oriented botanical gardens, Dr. Klein has the experience and judgment to lead the NTBG as it enters its fourth decade.

"NTBG has substantial programs in the collection and propagation of rare and endangered tropical species, research in tropical botany, education at all levels, scientific publications, and environmental conservation," Mr. Kinney continued. "Because of his experience in all these areas, Dr. Klein is well suited to develop NTBG into a world leader in tropical botany. Because of his contacts with other botanists, we hope that Bill Klein will promote NTBG as the locus of research in tropical botany in conjunction with other scientific institutions."

"Critical balances in tropical ecosystems throughout the world are gravely threatened and I share with my colleagues a deep concern over the losses in biodiversity," Dr. Klein said. "Clearly we must find more effective ways to change the attitudes and behavior of people toward the natural and manmade environments. The NTBG had been uniquely positioned to address these issues and I look forward to the opportunity my appointment provides to build on the wonderful successes of the past while we explore new ways to reach a wider audience with an extremely important message."

NTBG can be contacted by writing: P.O. Box 340, Lawai, HI 96765 or by calling the Kaua'i garden at 808-332-7324. Their fax number is 808-332-9765.

Want to Help Hawai'i's Forests?

The Hawai'i Tropical Forest Recovery Task Force is seeking reviewers and participants for its working groups. The mission of the Hawai'i Tropical Forest Recovery Task Force is "to develop strategies for the long-term management, protection, and utilization of the existing and potential forest resources of the State of Hawai'i." The 12-member task force has held working group sessions in six different areas: 1. Training, Inventory, and Research; 2. Natural Resource Management and Applied Research; 3. Traditional Uses and Public Participation; 4. Economic Development; 5. Institutions, Planning, Legal, and Legislative Support; and 6. Hawai'i's International Role. The task force and working groups have already met but input from "experts" are still needed. If you would like to act as a full working group member, reviewer, or resource support for a working group you can call Jan Lerum, Hawai'i Tropical Forest Recovery Task Force Coordinator, at 541-2628 or write to: Institute of Pacific Islands Forestry, 1151 Punchbowl St., Room 323, Honolulu, Hawai'i 96813.

Correction

The article "New Information on the Cause of Yellows Disease of *Dodonaea* (*A'ali'i*)" by Wayne Borth and Donald E. Gardner in Volume 32 Number 3, page 43 was missing an important citation. The following should have been included in the Literature Cited section of the article:

Gardner, D.E. 1980. Apparent pathological conditions of *Vaccinium* spp. and *Dodonea* sp. in Hawaii Volcanoes and Haleakala National Parks. pp. 125-128 in: C.W. Smith, ed. Proceedings of the 3rd Conference in Natural Sciences, Hawaii Volcanoes National Park, 1980. Cooperative Park Studies Unit/University of Hawaii at Manoa, Honolulu.

NEWSLETTER OF THE HAWAIIAN BOTANICAL SOCIETY
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Volume 33 Number 1 *March, 1994*

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More Records for Kahoʻolawe

Steven D. Warren
US Army CERL, Environmental Division, PO Box 9005, Champaign, IL 61826-9005
Derral R. Herbst
US Army Corps of Engineers, Pacific Ocean Division, Bldg. 223, CEPOD-ED-MS, Fort Shafter, HI 96858-5440

Recent collections add four new records to the checklist of plants from Kahoʻolawe. Chinese or Malayan banyan (*Ficus microcarpa* L. fil.) was discovered growing through the holes of a helicopter landing pad at the base of Moaula on the southeast side of the ancient cinder cone, 29 March 1993, *Warren K-93-1*. The plant was approximately 2 m tall. While the landing pad may act to conserve moisture, thus contributing to the short-term survival of the plant, the narrowness of the hole through which it grows will likely restrict long-term survival. This species has been documented as naturalized on Oʻahu, Maui and Hawaiʻi, and is suspected to occur in a naturalized state on most of the other main islands (Wagner et al. 1990).

Continued on page 3

Published by the Hawaiian Botanical Society, which was founded in 1924 to "advance the science of botany in all its applications, encourage research in botany in all its phases, promote the welfare of its members and develop the spirit of good fellowship and cooperation among them." Any person interested in the plant life of the Hawaiian Islands is eligible for membership. Information may be obtained from the Society:

c/o Department of Botany
3190 Maile Way
University of Hawai'i
Honolulu, HI 96822

Membership

The Society year is from December 1 through November 30.

Membership	**Cost per Year**
Regular	$7.50
Student	$4.00
Family	$10.00
Life (individuals only)	$150.00

Honorary and Life Members pay no further dues.

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Sterling Keeley
(UH Botany Department)

Vice-President
Lisa Stratton
(UH Botany Department)

Treasurer
Ron Fenstemacher
(Ka Papa Lo'i O Kanewai)

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Alvin Keali'i Chock
(UH Botany Dept. & USDA-APHIS/Retired)

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Appointed by the Executive Committee

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Donald P. Gowing
(Bishop Museum, Herbarium Pacificum)

Newsletter
Editor: Gregory A. Koob
(UH, Horticulture Department)

Conservation
Steve Montgomery
(UH)

Science Fair
Benton Pang
(UH, Botany Department)
Winona Char
(Char and Associates)

Native Plants
Clifford Smith, Chair
(UH)
Ken Nagata
(USDA, APHIS PPQ)
Evangeline Funk
(Botanical Consultants)
John Obata
(Bishop Museum)
Art Medeiros
(Haleakala National Park)

Continued from page 1

Aloe vera was discovered in a remnant flower bed near the site of the old ranch house at Kuheia Bay, 29 March 1993. Both yellow flowered (*Warren K-93-4*) and salmon to orange flowered (*Warren K-93-5*) varieties were collected. Both variants had stiff thorns along the margins of the leaves. Aloe is also present at Hakioawa. However, it is unclear if that population predates military use of the island or if it is a more recent introduction. Aloe is widely cultivated throughout the main Hawaiian islands but is not naturalized. Both the aloe and banyan specimens have been donated to the B.P. Bishop Museum.

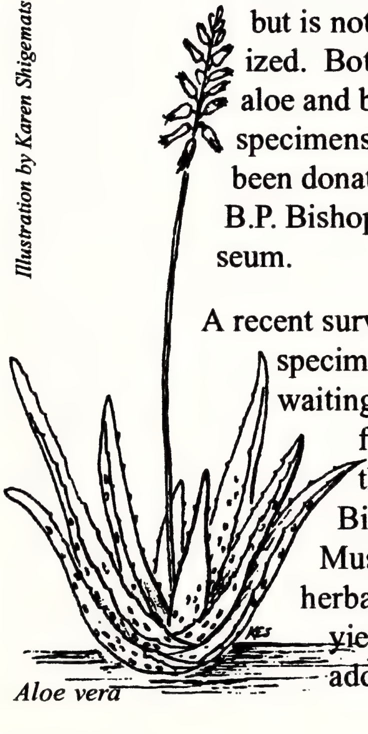
Illustration by Karen Shigematsu

Aloe vera

A recent survey of specimens waiting to be filed at the Bishop Museum herbarium yielded two additional records for Kaho‘olawe. *Flaveria trinervia* (Spreng.) C. Mohr was collected on Kaho‘olawe on 25 January 1991, *Z.E. Ellshoff 196*. This weedy species had formerly been collected only from naturalized populations in strand vegetation and coastal sites from Barber's Point to Sand Island and at Koko Head, O‘ahu (Wagner op. cit.). Because much of the helicopter transport to Kaho‘olawe, until recently, originated at Barber's Point, it is likely that this species may have arrived on equipment transported by the military.

An annual sprangletop grass [*Leptochloa uninervia* (K. Presl) Hitchc. & Chase] was collected by Stefanie Aschmann, former civilian Navy employee, on 24 April 1989 (*unnumbered collection*). This species was formerly known only from Kaua‘i, O‘ahu, Moloka‘i and Hawai‘i (Wagner op. cit.).

Reference

Wagner, W.L., D.R. Herbst and S.H. Sohmer. 1990. Manual of the Flowering Plants of Hawai‘i. University of Hawaii Press and Bishop Museum Press. Honolulu.

Raymond Fosberg: The Professional History of an Outstanding Botanist

Dieter Mueller-Dombois

Dr. F. Raymond Fosberg passed away in his home in Virginia on September 25, 1993, at the age of 85 years. He was a life-member of the Hawaiian Botanical Society, and all who had the privilege to know him will remember his kind and engaging personality.

F.R. Fosberg was educated in primary and secondary schools of Washington and California, 1914-1926. He attended Pomona College, Claremont, California, with strong courses in botany, zoology, chemistry and geology, publishing his first scientific (ecological) paper in 1929. He graduated with a baccalaureate in botany, 1930. His first professional position as a botanist in the Los Angeles County Museum, followed, 1930-1932, with a botanical expedition to southern New Mexico, in 1930. This resulted in several small publications.

In 1932 he accepted an assistantship to Prof. Harold St. John, University of Hawai‘i. During this time, 1932-1937, he participated in the six-month Mangarevan Expedition to the South Pacific islands. He received the degree of M.Sc. in botany at the University of Hawai‘i in 1935, for a monograph of the genus *Gouldia* (Rubiaceae). This started a life-long interest in the Rubiaceae, and the flora and vegetation of tropical islands.

In 1937 he was awarded a Morris Arboretum Fellowship in Botany, at the University of Pennsylvania, where he earned his degree of Doctor of Philosophy, in 1939. From this he went to the position of assistant botanist, in the U.S. Department of Agriculture, Washington, D.C., greatly broadening his botanical interests, including studies of the flora and vegetation of the eastern United States.

In 1942 Dr. Fosberg was sent to Colombia to search for stands of the genus *Cinchona* (Rubiaceae), source of quinine and related antimalarial alkaloids. He became an authority on the taxonomy of *Cinchona* and related genera of

Rubiaceae. He also attained a concept of the vegetation geography of the Andes and the south American rain forest. This work was interrupted in 1946, by participation as botanist in a six months "Economic Survey of Micronesia", initiating a continuing study of the flora and vegetation of the Micronesian Islands.

A temporary appointment as visiting professor at the University of Hawai'i in 1948, followed. A brief but important participation in the First International Symposium on Plant Taxonomy and Nomenclature at Utrecht in the summer of 1948, firmed up a lasting interest in botanical nomenclature. Since then he was an active participant in the Nomenclature Sections of eight international botanical congresses and a member of the Standing Committee for Spermatophyte Nomenclature. He was an honorary vice-president of the 8th and 12th International Botanical congresses.

Dr. F. Raymond Fosberg

In 1949, he undertook a general study of Pacific Island vegetation, supported by the U.S. Geological Survey and the U.S. Office of Naval Research through the Pacific Science Board, National Research Council. An important offshoot of this was the Pacific Science Board's coral Atoll Program, in which Dr. Fosberg played a principal role. This included the founding and editing of the Atoll Research Bulletin, which so far has resulted in 389 numbers dealing with island science in all its aspects. A major descriptive treatment of the vegetation of Micronesia was published in 1960.

In 1954 he was invited to take part in a symposium by UNESCO in scientific research in the humid tropics, which led to the establishment of the UNESCO International Committee on Humid Tropics Research. An important outcome of the UNESCO cooperation were two symposia organized by Dr. Fosberg on:

— Climate, Vegetation and Rational Land Utilization in the Tropics (Bogor, 1957); and

— Man's Place in the Island Ecosystem (Honolulu, 1961).

In 1966, his activities were transferred to the Smithsonian Institution, first, as Special Advisor on Tropical Botany, and later, as Curator of Botany and Senior Botanist. Major activities under Smithsonian sponsorship and financing were projects on the plant ecology of Ceylon and on a revised Handbook to the flora of Ceylon. Enormous herbarium collections were made and sets placed in herbaria at Peradeniya and Washington, and duplicates distributed to many other herbaria. A generation of Ceylonese botanists received valuable training as assistants in these projects.

Dr. Fosberg participated in the International Biological Program, 1967-1972, when he was active especially in its Terrestrial Conservation Directorate, primarily producing the IBP "Classification of Vegetation for General Purposes" (1967).

From 1950 on, until her death in 1986, he was ably and effectively assisted by Dr. Marie-Hélène Sachet, who became a world authority on coral atolls, and with whom he completed the volume, Island Bibliographies (1956) and its Supplements (1971). An important activity with M.-H Sachet and D.R. Stoddart, was a successful campaign for the protection of Aldabra Island, in the Indian Ocean.

Other productive interests have been the Geography and the Natural History of the Marshall Islands, a field course in Tropical Botany in St. Croix, U.S. Virgin Islands, a flora of the sand cays of Belize, a flora and vegetation of the Phoenix Islands, and, with D.R. Stoddart and M.-H. Sachet, a flora of the sand cays of the northern Great Barrier Reef. He has, since 1932, maintained an active interest in the vegetation and flora of the Hawaiian Islands. The work on Pacific vegetation has continued until his death together with the writer, on a volume on Pacific Island Vegetation. In combination with his interest in island vegetation, Dr. Fosberg continued work on the taxonomy of island plants, particularly concerning the Micronesian and Polynesian floras. A volume on the Flora of Micronesia (Smithsonian Contributions to Botany No. 81) has been published posthumously.

Extensive travel has given Dr. Fosberg a concept or world geographic and vegetational patterns, coral reefs, volcanology, as well as insular phenomena, probably equalling those of most living botanist, and a broad world view.

Honors have not been lacking. He was awarded four honorary Ph.D. degrees, by Pomona College (1980), the University of Guam (1985), the University of Peradeniya (1986), and the University of the South Pacific (1989). He received the Fermat Bronze Medal, the H.E. Gregory Medal, the George Davidson Medal, the Browning Award, the Robert Allerton Award, and a number of others. He served for 10 years as President of the International Society for Tropical Ecology. He has been a member, honorary or active, of numerous professional and conservation organizations. He was invited and participated in all four International Conferences on the Environmental Future and was active in numerous other conferences, congresses, and symposia in ecology and conservation. He served as a board member and two terms as vice-president of the U.S. Nature Conservancy.

Perhaps more significantly, he has advised and helped a great number of younger colleagues in developing their careers. He may be longest remembered for this, and for the vast numbers of documented specimens he has deposited and made available in the herbaria and museums of the world. His publications, small and large, exceed 660 in number and they refer to a large number of topics, many of them relating to floristics and the vegetation ecology of islands.

Dr. Fosberg will never be forgotten in the history of Pacific botany. His life was full of dedication to field botany and to his colleagues and friends. He will be sorely missed by all those who were touched by his outstanding personality.

Honolulu, January, 1994

BOTSOC Minutes

December 6, 1993

President Keeley called the December meeting to order at 7:35 p.m.

New guests were introduced: Lee Hardwick and Brian Lym

It was announced that the January meeting would meet on the 10th congruent with last year's amendment to the society's constitution and by-laws.

Minutes of the November meeting were read, and accepted. The secretary's annual report was made available to the Society. The treasurer's report was read and accepted. The treasurer deferred his annual report until January.

Membership chair Don Gowing proposed the following for membership: Dr. John Hall as a life member, Lisa Stratton, Walter Appleby, Lisa Gollin, Barbara Hawley, Denis Kennedy, and Steven Evans as new members. They were all accepted. Total membership to date: 149 members, made of: 33 life, 7 honorary, 57 regular, 22 student, 12 family, and 10 paid institutional memberships.

Unfinished Business

Letter signed by the Society on protection of native ecosystems was published in the Honolulu Advertiser on November 28th.

New Business

Nā Ala Hele trails workshop was attended by President Keeley and Secretary Pang. Although there was wide diversity in the organizations present there was also a considerable amount of cooperation in the planning and use of trails on O‘ahu.

An announcement was made for interested persons to become working group members for the Hawai‘i Tropical Forestry Recovery Task Force.

A thank-you was given to our editor, Greg Koob, for an outstanding first year.

The nominating committee proposed the list of officers for 1994 as follows: Dr. Sterling Keeley, president; Lisa Stratton, vice-president; Ron Fenstenmacher, treasurer; Benton Pang, secretary; Board of Directors Leilani Pyle and Alvin Keali‘i Chock. A unanimous ballot was cast by the secretary.

Vice-president Keith Tomlinson announced the speaker of the month, Edith MacKenzie of the Honolulu Community College. She spoke on Hawaiian kapa, its manufacture, the tools and plants involved, and spiritual significance of this unique art form.

January 10, 1994

President Keeley called the January meeting to order at 7:35 p.m.

Minutes of the December meeting were read and accepted.

Treasurer's report was read and accepted. The treasurer's annual report was made available to the Society.

New Business

The recovery plan for *Panicum fauriei* var. *carteri* was available for comment and review.

Vice-president Lisa Stratton announced the plant and speaker of the month, Dr. Guillermo Goldstein of the botany department, University of Hawai'i. The plant of the month was the Hawaiian silversword and its ecophysiological adaptations to growing conditions on the summit of Haleakala, Maui.

Dr. Goldstein's main talk was on the plants along an altitudinal gradient in northern Venezuela. He described in detail the vegetation types found in Venezuela from the coast to 5,000 feet elevation. Of special interest were pictures of *Polylepis*, which grows near rock outcroppings at 5,000 feet. This is the highest elevation reached by any arborescent angiosperm.

The checklist of the plants of Kaho'olawe published in the June 1993 issue of the newsletter was originally compiled in 1991. A much improved and expanded checklist will soon be available. Anyone interested in receiving a free copy of the revised checklist should write to Dr. Steven D. Warren, USACERL-ENB, PO Box 9005, Champaign, IL 61826-9005

Annual Report of the Secretary for 1993

Officers for 1993

Executive Council

President — *Sterling Keeley* (University of Hawai'i Botany Department)

Vice-President — *Keith Tomlinson* (Bishop Museum Education Department)

Treasurer — *Ron Fenstenmacher* (Ka Papa Lo'i Kanewai)

Secretary — *Benton K. Pang* (University of Hawai'i Botany Department)

Directors — *Isabella Abbott* (University of Hawai'i Botany Department) and *Leilani Pyle* (Bishop Museum Herbarium Pacificum)

Committees appointed by the Executive Council

Membership — *Donald P. Gowing*

Newsletter — *Gregory A. Koob* (University of Hawai'i Horticulture Department)

Conservation — *Steve Montgomery* (Conservation Council for Hawai'i)

Science Fair — *Benton Pang* (University of Hawai'i Botany Department) and *Winona Char* (Char and Associates)

Native Plants — *Clifford Smith*, chair (University of Hawai'i Botany Department

Society Activities

March — The Society filed an intent to sue with the Sierra Club Legal Defense Fund for the listing of endangered species on Kaua'i

The Society donated t-shirts as prizes for Paradise Pursuits Environmental Quiz show.

April — The executive Board drafted a letter to Nā Ala Hele (DOFAW) condemning the damage to native plants due to their trail clearing activities and increased bike activity on Mānoa Cliffs Trail.

The Science Fair Committee gave 4 awards at the State Science Fair:

Senior Research Division

1st - Dianella Howarth, Moanalua H.S. Evolution of *Scaevola* spp. [Prize: $50, *Lā'au Hawai'i* book, botany department t-shirt]

2nd - David Hemmes, Waiākea H.S. Growth of Oyster Mushrooms on Guava and Koa Wood Ships. [Prize: $25, *Lā'au Hawai'i* book, botany department. t-shirt]

3rd - Tanya Regal, Kamehameha H.S. Microbial Assay of *Chamaesyce multiformis* [Prize: $25, *Lā'au Hawai'i* book, botany department t-shirt]

Junior Research Division

E. Herron-Williams and Kauikeola Wilcox, Waimea Elem./Inter. The Effects of Host Plants on Sandalwood Growth [Prize: $25, *Lā'au Hawai'i* book, botany department. t-shirt]

December — The President and Secretary participated in a trail workshop organized by Nā Ala Hele

Monthly Speakers

January — Dr. Loyal Mehrhoff of the Bishop Museum spoke on the endemic genus *Trematolobelia* in Hawai'i. Speaker of the month was Betsy Gagné on the vegetation zones of Papua New Guinea.

February — Fiona Norris spoke on the endemic African plant *Welwitschia mirabilis*.

Speaker of the month was Vice-President Keith Tomlinson on the rain forests of Costa Rica.

March — Secretary Benton Pang spoke on the ethnobotanical uses of kauila, *Alphitonia ponderosa* and the endangered *Colubrina oppositifolia*. Speaker of the month was Dr. George Staples of the Bishop Museum botany department on "progress and prognosis" for *In Gardens of Hawai'i II*.

April — Dr. Richard Norris and Dr. Isabella Abbott spoke on the red alga *Amansia* and its history of collection. Speaker of the month was Dr. Deborah Woodcock of the geography department of the University of Hawai'i. The title of her talk was, "Climate reconstruction based on biological indicators with special reference to quaternary pollen and microfossil records."

May — Dianella Howarth from Moanalua High School spoke on her research on *Scaevola* in Hawai'i. Speaker of the month was Colin Basset of the Hawai'i Conservation Biology Initiative on its mission, function and research priorities.

September - Dr. Loyal Mehrhoff of the USFWS spoke on the endangered *Delissea undulata*. Speaker of the month was Ray Baker of the Lyon Arboretum on plants of the Pacific.

October — Board of director Isabella Abbott spoke on the traditional uses of gourds. Newsletter editor Greg Koob spoke on tissue culture research at the Lyon Arboretum.

November — Steve Perlman of the Hawai'i Plant Conservation Center spoke on the effects of Hurricane 'Iniki one year later.

December — Edith MacKenzie spoke on the Hawaiian kapa (bark cloth).

Respectfully submitted,
Benton Kealii Pang

Treasurer's Report

January to December 1993

The Society published five newsletters in 1993, thanks to editor Greg Koob's diligence. Bringing the Newsletter up to date was costly which is why the Society is in the red for the year.

Income		Outgo	
Dues	$982.55	Copying Charges	$782.18
Plant Sale	$94.00	Postage	$504.78
Interest	$86.02	Science Fair Prizes	$241.92
W. Char Assoc.	$50.00	Monthly Refreshments	$68.85
Book Sale	$14.12	Paradise Pursuit Prizes	$50.00
Poster Sale	$11.00	Stationery	$19.88
	$1237.69		$1677.61

Beginning Balance + Income - Outgo = Ending Balance
$4777.32 + $1237.69 - $1677.61 = $4337.40
Total loss for 1993 is $439.92

Respectfully Submitted,
Ron Fenstemacher

NEWSLETTER OF THE HAWAIIAN BOTANICAL SOCIETY
C/O DEPARTMENT OF BOTANY
UNIVERSITY OF HAWAI'I AT MĀNOA
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Newsletter of the
Hawaiian Botanical Society
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Biocontrol of Ivy Gourd (*Coccinia grandis*) on Windward O'ahu

Donald E. Gardner
US National Biological Survey, Cooperative Park Studies Unit, Department of Botany, University of Hawai'i at Mānoa, Honolulu, HI 96822

Coccinia grandis (L.) Voigt, commonly known in Hawai'i as ivy gourd, is becoming increasingly apparent as the Hawaiian counterpart of kudzu at lower elevations of Windward O'ahu. This aggressive vine was described in Hawai'i in 1986 (Linney, 1986) when its noxious qualities had become recognized, but is thought to have been first introduced in 1969 from Fiji, where it was naturalized, as a suitable species for cultivation as an ornamental. The genus *Coccinia* originates from tropical Africa and the regions surrounding the Indian Ocean. The initial introduction in Hawai'i was to O'ahu, but it is known also from the Kona Coast of the Big Island (Linney, 1986; Wagner et al. 1990) and probably elsewhere. In recent years, ivy gourd has been targeted for biological control research by the Department of Agriculture, joined by my own efforts. Among a number of

Continued on page 15

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(Haleakala National Park)

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insect species collected by DOA exploratory entomologist Robert Burkhart in Africa and Asia as possible biocontrol agents, a rust fungus, tentatively identified as *Puccinia cucumeris* P. Henn., was found in the region of Lake Victoria in Africa. Although Burkhart was able to collect enough material to verify the presence of the rust, the hostility he perceived among the local residents of the area toward his presence prevented his collecting sufficient amounts of the material to be of direct application in our program. Subsequently, we established the beginning of a working relationship with a mycologist in Nigeria, who reported the fungus on two other species of *Coccinia* in Zambia and his own country. However, our attempts to reach a collaborative agreement were not successful and the rust has yet to be tested for its effectiveness in controlling ivy gourd in Hawai'i.

Notwithstanding our own attempts at biocontrol of this vine, a naturally occurring powdery mildew-incited disease has become prominent on ivy gourd in many locations of Windward O'ahu and perhaps elsewhere on the island. Whereas no quantitative data have been taken to document the extent of the disease, the effect is readily visible. Infection by the fungus has caused entire vines to quickly wilt and die, often with dried leaves still attached. Older infected vines have become completely desiccated and defoliated, resulting in a striking denuded appearance of trees, shrubs, and inanimate roadside objects previously shrouded with vigorous green foliage.

The origin of the powdery mildew is not known. Members of this group of fungi, which appear as superficial white or grayish-white growth on the surface of the leaf and produce asexual spores (conidia) which are typically windborne, are difficult to classify in Hawai'i where the sexual stage is not formed. Thus the host ranges of the various powdery mildew fungi are difficult to determine, particularly in the absence of controlled cross-inoculation experiments. The current extent of damage caused by this naturally occurring biocontrol agent is as great or greater than that which we may expect from a successful agent which had been purposefully introduced for biocontrol. However, as is true with introduced biocontrol agents and most natural enemies in general, populations fluctuate and environmental conditions favoring or disfavoring both the agent and the host are constantly in play. For this reason, the activity and effectiveness of biocontrol agents are more evident at some times than at others. Biocontrol often is considered effective when it reduces the vigor and aggressiveness of the target weed, as appears to be the case with ivy gourd, rather than eliminating it. Although at times in the future the fungus may be expected to be less obvious, it should remain present in the environment until conditions again become favorable for its expression.

Literature Cited

Linney, G. 1986. *Coccinia grandis* (L.) Voigt: A new cucurbitaceous weed Hawai‘i. Newsletter of the Hawaiian Botanical Society 25:3.

Wagner, W.L., Herbst, D.R., and Sohmer, S.H. 1990. Manual of the flowering plants of Hawai‘i. University of Hawaii Press and Bishop Museum Press, Honolulu.

Ivy Gourd Brochure Available from The Outdoor Circle

A brochure is now available from The Outdoor Circle on the problem and control of ivy gourd. It covers the history of ivy gourd in Hawai‘i, concentrating on O‘ahu. Problem areas are listed and a description of the species and its growth habit is given, with line drawings.

Suggested control measures are described, again with line drawings.

The brochure is designed as a self-mailer and if you would like to receive a copy please contact:

The Outdoor Circle
1110 University Avenue
Suite 406
Honolulu, HI 96826

Phone: (808) 943-9658
Fax: (808) 955-7364

"Easily" Cultivated Native Hawaiian Flora

J.K. Obata

A recent surge in popularity for growing endemic (native) Hawaiian flora has prompted numerous inquiries about their cultivation potential. Unfortunately there is hardly any guide suggesting which taxa can be successfully propagated with some degree of success. An attempt is made here to list those with easier cultural potential.

While trying to grow natives, some simple cultural requirements must be observed. Foremost in cultural procedures is adequate air movement and a well-draining medium. In the early stages of growth, fungicides or/and bactericides may be a requirement. A majority of the taxa with root bound pots must never be dried out as this condition quite often will prove fatal. Excessive amounts of fertilizers often are tolerated but is not required of natives as long as the medium is not completely dried out. Pesticides/miticides quite often are needed, but it is best to avoid them. As much as possible, wettable powdered forms should be used. Liquid pesticides are quite deleterious especially when using organophosphates. The liquid solvents may be the deleterious ingredient. One may substitute a weak soap or detergent solution as a slight deterrent.

Pests generally abound against the natives. For some taxa the Chinese rose beetle (*Adoretus sinicus*) is a leaf defoliator. Ants as a cultivator of mealy bugs indirectly is a source of demise for many taxa. The black twig borer (*Xylosandrus compactus*) is a major source of young twig death and eventual destructor of the plant. Slugs may decimate young seedlings or growing tips of many taxa. Nematode worms, bacteria, and fungi take their toll. Nematodes consistently shorten the life span of many taxa. And this is not to mention the toll exacted by cockroaches, rats, and mice.

Growing media should be sterilized. Artificial, commercial potting mixes with added aerating sponge rock is recommended. Soil media from their natural habitat usually give negative results. When transplanting, roots must not be disturbed. Transplants must be placed in a shady, moist environment for a few weeks, even for sun-loving taxa.

Growing natives, quite often, is clonally dictated. It is simply a matter of selection. Just because one is successful with a single clone does not preclude that the entire taxon would be met with equal success. However, some taxa do have higher success rates.

Which taxon should one grow? Generally plants from the more xeric (drier) habitats are easier to cultivate than those from wetter areas. Generally pot culture is fairly simple under proper cultural procedures. However, when seedlings are planted into the ground, the selection process seems to begin again and mortality rates abound. Hopefully in another paper this matter can be addressed.

The following list, with some comments, is a simple guide for plants that may be "successfully" cultivated in a more "urban" setting. The listing is alphabetized by families and generally refers to O`ahu taxa. Opinion and taxon selection is solely that of this writer. Nomenclatural references are based on Wagner, Herbst and Sohmer, 1990.

Amaranthaceae	
Achyranthes splendens var. *rotundata*	
Charperntiera obovata (pāpala)	
Charpentiera tomentosa (pāpala)	
Nototrichium sandwicensis (kulu‘ī)	Requires a lot of sunshine.
Apocynaceae	
Ochrosia compta (hōlei)	
Rauvolfia sandwicensis (hao)	
Araliaceae	
Munroidendron racemosum	
Reynoldsia sandwicensis (‘ohe makai)	
Arecaceae (Palmae)	
Pritchardia (loulu)	All species are easily cultivated. Needs heavy fertilizing of nitrogen and iron chelates.

Asteraceae (Compositae)

Bidens (ko‘oko‘olau)	All taxa from drier areas.
Bidens amplectens	Short-lived but has large showy flowers.
Lipochaeta integrifolia, L. lobata, L. tenuifolia	Generally short-lived under cultivation.

Campanulaceae

Brighamia insignis (‘ōlulu)	Like sunny areas. Short-lived (several years under cultivation). Many of the lobelioids may be cultivated in cooler upland areas, but are generally short-lived (2-4 years).

Convolvulaceae

Bonamia menziesii	An aggressive liana.

Fabaceae (Leguminosae)

Acacia koa and *A. koaia* (koa)	
Caesalpinia (Mezoneuron) kavaiensis (uhiuhi)	
Canavalia galeata (‘āwikiwiki)	
Erythrina sandwicensis (wiliwili)	Easily grown from cuttings.
Senna (Cassia) gaudichaudii (kolomona)	
Sesbania tomentosa (‘ohai)	Generally short-lived in cultivation. Two-plus years.

Goodeniaceae

Scaevola gaudichaudii (naupaka kuahiwi)	Dryland yellow form.
Scaevola sericea (naupaka kahakai)	

Liliaceae

Dianella sandwicensis (‘uki‘uki)	

Malvaceae

Abutilon menziesii (ko‘oloa‘ula)	Prefers sunny, dry habitats.
Gossypium tomentosum (ma‘o)	Short-lived in cultivation.
Hibiscadelphus distans	Leaves ravaged by rose beetles.
Hibiscus (aloalo)	All red and white species are easily cultivated. May be propagated from cuttings.
Hibiscus brackenridgei (ma‘o hau hele)	Rapid grower in cultivation, short-lived, 2-4 years in cultivation, usually two.
Kokia kauaiensis (kokia)	
Sida fallax (‘ilima)	Short-lived in cultivation, usually two years.

Myoporaceae

Myoporum sandwicense (naio)	Easiest to cultivate. From bush to small tree. Grows well under all conditions.

Nyctaginaceae

Boerhavia	All native species are easy to grow.
Pisonia (pāpala kēpau)	All species easy to grow. Tend to be large trees.

Piperaceae

Peperomia leptostachya and *P. tetraphylla*	Does well when grown under drier and shady conditions.

Pittosporaceae

Pittosporum (hō‘awa)	All species are easy to grow. *P. confertiflorum* is the most showy of them all.

Plumbaginaceae

Plumbago zeylanica (‘ilie‘e)	Likes drier areas.

Portulacaceae

Portulaca	All native species do well in dry, sunny, well-drained areas.

Rosaceae

Osteomeles anthyllidifolia (‘ūlei)	Ground cover. Hardy and grows well in sunny areas. Can tolerate some shade.

Rubiaceae

Canthium odoratum (alahe‘e)	Grows under all conditions.
Gardenia brighamii	Grows well in sunny, drier areas.

Sapindaceae

Dodonea viscosa (a‘ali‘i)	Male plant required if seed capsule desired. (See note on page 21. *-ed*)
Sapindus oahuensis (āulu, kaulu)	Becomes large tree.

Thymeliaceae

Wikstroemia oahuensis (‘ākia)	Lives 3-5 years.
Wikstroemia uva-ursi (‘ākia)	Well adapted for landscaping.

Verbenaceae

Vitex rotundifolia (pōhinahina)	Aggressive crawler. Requires a lot of sunlight.

Are Males Really Necessary?

J.K. Obata

'A'ali'i (*Dodonaea viscosa*) commonly is used for a Hawaiian landscape plant. Besides being a native plant and one of the easier ones to grow — it is at home from sea level and xeric habitat to mesic wet forest habitat, it's matured floral-bracts-pods are extensively use in haku leis.

With all its glamour and ease, one must be aware of some of its drawbacks. Many are aware of its generally dioecious nature (each plant is either male or female). Thus when planting them for landscaping purposes, the predictability of staminate (male) or pistilliate (female) plants is quite unreliable. Infrequently some may exhibit both sexes in a restricted sense.

In a quest to have only pistillate plants to enhance the landscape, one is inclined to destroy the staminate — lacking the ability to produce a colorful landscape. With the elimination of all the males, a simple problem arises. Without fertilization, pod development ceases. Without fertilization, the unfertilized pods (bracts) have a tendency to drop quite prematurely

This is a simple concept, but in its simplicity frequently overlooked. Yes, at least one male is needed.

Observation of Honey Bee Pollinating *Hesperomania arbuscula*

J.K. Obata

On April 26, 1994, an attempt was made to pollinate the endangered *Hesperomani arbuscula* flowers then in bloom in Waianae Kai. This attempt was predicated by the lack of viable seeds in recent years.

While observing the plants, a honey bee (*Apis*) was noticed hovering over the inflorescence. Later the bee landed on the protruding stamens of the flower head and began the process of probing into each floret of the head. In the process, it accumulated pollen grains over its wings and legs. Apparently this maneuver helped in the pollination of the flower. This process was repeated by more than one bee.

Now there is an alien pollinator to help where the native pollinator may have been extirpated by alien ants. However, the flower heads also seem to be attacked by another alien insect which has an affinity to the developing young seeds.

Minutes for February 7, 1994

President Keeley called the February meeting to order at 7:35 p.m.

Minutes of the January meeting were read and accepted.

The treasurer's report was read and accepted.

The membership committee proposed three new members: Keoki Nunies, Roselle-Jane Canosa, and Luan Pham. All three are NSF interns from Farrington working at the Bishop Museum botany department.

New Business

A motion was passed to purchase five botany t-shirts as donations to the Paradise Pursuits environmental quiz show. The amount of the shirts would be $50.

Announcements

Alaskan Natural History field trips.

Hawai‘i Coalition of Conservation Voters orientation meeting.

Position for manager of conservation programs at the Center for Plant Conservation

Plant sale in May

March 19th meeting on native plants for gardens in Hilo, Hawai‘i.

Vice president Lisa Stratton announced the plant and speaker of the month, Kevin Beach of the botany department, University of Hawai‘i. The plants of the month were two red algae, *Anpheltiopsis concinna* and *Laurencia* sp. "green". He showed slides of these taxonomically similar algae with some interesting historical background on their distributions in Hawai‘i.

Dr. George Wong of the botany department spoke on mushrooms in Hawai‘i. He showed fascinating slides of fungi, their substrates and their ecological habitats. The study is part of a new book to be published on Hawaiian fungi. The study notes that although there are very few species that occur in small quantities in Hawai‘i he and colleagues are still describing new species collected in the field.

Minutes for March 7, 1994

President Keeley called the March meeting to order at 7:35 p.m.

George Staples introduced Dr. Clayton, the speaker of the month.

Minutes of the February meeting were read and accepted.

The treasurer's report was read and accepted.

The membership committee proposed no new members.

Announcements

Plant Sale in May.

New Business

A motion was passed to donate prizes to the State Science Fair. The amount would cover purchase of two *La‘au Hawai‘i* books and two $50 checks.

Don Gowing informed the Society that Sinclair Library archives all the Society's letters, newsletters, and correspondences. Arrangements to see and add to the collection are made through the archivist in the Hawaiian-Pacific collections.

Patrick Conant informed the Society of insects being studied as biological controls for miconia. He noted miconia's distribution has increased and DOFAW-Maui has been experimenting with some management methods in Hana. He asked the Society to support a group to survey the miconia locations on O'ahu. A motion was passed to send a letter to Michael Buck to survey O'ahu for miconia.

Vice president Lisa Stratton announced the plant of the month speaker, Susan Cordell-Hart of the botany department, University of Hawai'i. The plant of the month was *Cyanea shipmanii*, an endangered plant found in the Hakalau Wildlife Refuge. The lobelia of the wet montane forest was once thought to be extinct but rediscovered in February of last year and more individual are being found within the refuge. About 6 plants are now known, and there seems to be rat damage to the leaves.

George Staples introduced the speaker of the month, Dr. Derrick Clayton, a retired botanist from Kew Botanical Gardens. He is presently in Hawai'i for two months looking at grass collections at the Bishop Museum. Dr. Clayton briefly described the classification system for grasses and outlined the "codes of taxonomy." He described the morphology and biology of grasses including their evolutionary relationships and ecological distributions. Dr. Clayton described the ecological roles grasses play in nature and the economic importance some species play for humans.

Later this summer a special issue of the newsletter will be published. It will be dedicated to issues surrounding Hawaii's endangered flora. In addition to articles about specific issues pertaining to endangered species, it will also include the most recent listing of plant species covered by the Federal Endangered Species Act. The listing will include the dates the plants were listed and will also give expected dates for future listings of the proposed species. If you would like to receive a copy of this special issue, and help the Society raise much-needed funds, send $3.00 to:

Special Newsletter, 1994
Hawaiian Botanical Society c/o Department of Botany
3190 Maile Way
University of Hawai'i
Honolulu, HI 96822

NEWSLETTER OF THE HAWAIIAN BOTANICAL SOCIETY
C/O DEPARTMENT OF BOTANY
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Newsletter of the
Hawaiian Botanical Society
Special Issue *September, 1994*

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Special Issue

We are issuing this special issue of the Newsletter of the Hawaiian Botanical Society to get the latest listing of endangered and threatened plants out to our members. The list was last updated August 18, 1994. We have tried to make the list as useful as possible so it is presented three ways. An anotated bibliography of plant conservation references is also included.

The Society is sending this list to all members but we are asking for a $3.00 donation to cover our printing and mailing costs. You can either mail in the donation or bring it to a monthly meeting. Also, if you would like extra copies at $3.00 each, a form is included inside the back cover.

Key

SMITHSONIAN
LIBRARIES

E	Listed Endangered
T	Listed Threatened
PE	Proposed Endangered
C1	Candidate for immediate listing
C2	Potential candidate for listing
*	Very possibly extinct
#	Extremely rare (<10 plants or only one population)

H	Hawai‘i	Ka	Kaho‘olawe
M	Maui	Nii	Ni‘ihau
L	Lāna‘i	N	Nihoa
Mo	Moloka‘i	La	Laysan
O	O‘ahu	Mi	Midway
K	Kaua‘i	PH	Pearl and Hermes
X	Extinct on that Island		

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Art Medeiros
(Haleakala National Park)

Plants Listed, Proposed, and Candidates Under the U.S. Endangered Species Act as of August 18, 1994

Listed Taxa (173 taxa)

Abutilon eremitopetalum	Hidden-petaled abutilon	E#	L
A. menziesii	Ko‘okoa‘ula	E	H, M, L, OX
A. sandwicense	No common name	E	O
Acaena exigua	Liliwai	E*	MX, KX
Achyranthes splendens var. *rotundata*	No common name	E	LX, MoX, O
Alectryon macrococcus var. *auwahiensis*	Māhoe	E#	M
A. macrococcus var. *macrococcus*	Māhoe	E	M, Mo, O, K
Alsinidendron obovatum	No common name	E	O
A. trinerve	No common name	E#	O
Argyroxiphium kauense	Ka‘ū silversword	E	H
A. sandwicense ssp. *macrocephalum*	Haleakalā silversword	T	M
A. sandwicense ssp. *sandwicense*	Mauna Kea silversword	E	H
Bidens cuneata	Ko‘oko‘olau	E	Mo, OX
B. micrantha ssp. *kalealaha*	Ko‘oko‘olau	E	M, L
B. wiebkei	Ko‘oko‘olau	E	Mo
Brighamia insignis	‘Ōlulu	E	K, NiiX
B. rockii	Ālulu	E	MX, LX, Mo
Caesalpinia kavaiensis	Uhiuhi	E	H, MX, L, O, KX
Canavalia molokaiensis	‘Āikiwiki	E	Mo
Centaurium sebaeoides	‘Āwiwi	E	M, L, MoX, OX, K
Chamaesyce celastroides var. *kaenana*	‘Akoko	E	O
C. deppeana	‘Akoko	E#	O
C. halemanui	‘Akoko	E	K
C. kuwaleana	‘Akoko	E	O
C. skottsbergii var. *skottsbergii*	‘Akoko	E	Mo, O
Clermontia lindseyana	‘Ōhā wai	E	H, MX
C. oblongifolia ssp. *brevipes*	‘Ōhā wai	E#	Mo
C. oblongifolia ssp. *mauiensis*	‘Ōhā wai	E#	M, LX
C. peleana ssp. *peleana*	‘Ōhā wai	E#	H
C. peleana ssp. *singulifolia*	‘Ōhā wai	E*	HX, MX
C. pyrularia	‘Ōhā wai	E#	H
Colubrina oppositifolia	Kauila	E	H, O
Cyanea asarifolia	Hāhā	E#	K
C. copelandii ssp. *copelandii*	Hāhā	E#	H
C. grimesiana ssp. *obatae*	Hāhā	E#	O
C. hamatiflora ssp. *carlsonii*	Hāhā	E#	H
C. lobata	Hāhā	E*	MX, LX
C. macrostegia ssp. *gibsonii*	Hāhā	E	L

C. mannii	Hāhā	E	Mo
C. mceldowneyi	Hāhā	E	M
C. pinnatifida	Hāhā	E#	O
C. procera	Hāhā	E	Mo
C. shipmanii	Hāhā	E#	H
C. stictophylla	Hāhā	E#	H
C. superba ssp. *regina*	Hāhā	E*	OX
C. superba ssp. *superba*	Hāhā	E#	O
C. truncata	Hāhā	E	O
C. undulata	Hāhā	E	K
Cyrtandra crenata	Ha'iwale	E*	OX
C. giffardii	Ha'iwale	E	H
C. limahuliensis	Ha'iwale	T	K
C. munroi	Ha'iwale	E#	L
C. polyantha	Ha'iwale	E	O
C. tintinnabula	Ha'iwale	E	H
Delissea rhytidosperma	'Ōhā	E#	K
Diellia falcata	No common name	E	O
D. pallida (proposed as *D. laciniata*)	No common name	E#	K
D. unisora	No common name	E#	O
Dubautia herbstobatae	Na'ena'e	E	O
D. latifolia	Na'ena'e	E	K
D. pauciflorula	Na'ena'e	E	K
Eugenia koolauensis	Nīoi	E	MoX, O
Exocarpos luteolus	Heau	E	K
Gahnia lanaiensis	No common name	E	L
Gardenia brighamii	Nā'ū	E	HX, MX, L, Mo, O
Geranium arboreum	Nohoanu	E	M
G. multiflorum	Nohoanu	E	M
Gouania hillebrandii (CH)	No common name	E	M, LX, Mo, KaX
G. meyenii	No common name	E	O, K
G. vitifolia	No common name	E#	HX, MX, O
Haplostachys haplostachya	No common name	E	H, MX, KX
Hedyotis cookiana	'Āwiwi	E	H, K
H. coriacea	No common name	E	H, M, OX
H. degeneri var. *coprosmifolia*	No common name	E#	O
H. degeneri var. *degeneri*	No common name	E#	O
H. mannii	No common name	E	MX, L, MoX
H. parvula	No common name	E#	O
H. st.-johnii	No common name	E	K
Hesperomannia arborescens	No common name	E	M, LX, Mo, O
H. arbuscula	No common name	E	M, O
H. lydgatei	No common name	E	K
Hibiscadelphus distans	Hau kuahiwi	E	K
Hibiscus arnottianus ssp. *immaculatus*	Ke'oke'o	E	Mo
H. clayi	Koi'o 'ula'ula	E#	K

Huperzia mannii (listed as *Lycopodium mannii*)	Wawae‘iole	E	H, M, KX
H. nutans (listed as *Lycopodium nutans*)	Wawae‘iole	E	O, KX
Ischaemum byrone	Hilo ischaemum	E	H, M, Mo, K
Isodendrion hosakae	Aupaka	E#	H
I. pyrifolium	Aupaka	E#	H, MX, LX, MoX, O, NiiX
Kokia cookei	Cooke's koki‘o	E*	MoX
K. drynarioides (CH)	Hau hele‘ula	E#	H
Labordia lydgatei	Kāmakahala	E#	K
Lipochaeta fauriei	Nehe	E	K
L. kamolensis	Nehe	E	M
L. lobata var. *leptophylla*	Nehe	E#	O
L. micrantha var. *exigua*	Nehe	E	K
L. micrantha var. *micrantha*	Nehe	E	K
L. tenuifolia	Nehe	E	O
L. venosa	Nehe	E	H
L. waimeaensis	Nehe	E#	K
Lobelia niihauensis	‘Ōhā	E	O, K, NiiX
L. oahuensis	‘Ōhā	E	O
Lysimachia filifolia	No common name	E	O, K
L. lydgatei	No common name	E#	M
Mariscus fauriei	No common name	E	H, L, Mo
Marsilea villosa	‘Ihi‘ihi	E	Mo, O
Melicope haupuensis	Alani	E#	K
M. knudsenii	Alani	E#	MX, K
M. lydgatei	Alani	E#	O
M. mucronulata	Alani	E#	MX, Mo
M. pallida	Alani	E	OX, K
M. quadrangularis	Alani	E#	K
M. reflexa	Alani	E	Mo
Munroidendron racemosum	No common name	E	K
Neraudia angulata var. *angulata*	Ma‘aloa	E#	O
N. angulata var. *dentata*	Ma‘aloa	E	O
Nothocestrum breviflorum	‘Aiea	E	H
N. peltatum	‘Aiea	E	K
N. humile	Kulu‘ī	E	M, O
Ochrosia kilaueaensis	Hōlei	E*	HX
Panicum fauriei var. *carteri* (CH)	Carter's panicgrass	E	M, Mo, O
Peucedanum sandwicense	Makou	T	M, Mo, O, K
Phyllostegia glabra var. *lanaiensis*	No common name	E*	LX
P. mannii	No common name	E#	MX, Mo
P. mollis	No common name	E	M, MoX, O
P. waimeae	No common name	E	K
Plantago hawaiensis	Laukahi kuahiwi	E#	H
Poa sandvicensis	No common name	E	K
P. siphonoglossa	No common name	E	K

Portulaca sclerocarpa	‘Ihi	E	HL
Pritchardia affinis	Loulu	E	H
P. munroi	Loulu	E#	Mo
Pteralyxia kauaiensis	Kaulu	E	K
Remya kauaiensis	No common name	E	K
R. mauiensis	No common name	E#	M
R. montgomeryi	No common name	E#	K
Rollandia crispa	‘Ōhā	E	O
Sanicula mariversa	No common name	E	O
Santalum freycinetianum var. *lanaiense*	‘Iliahi	E	M, L
Scaevola coriacea	Dwarf naupaka	E	HX, M, LX, Mo, OX, KX, NiiX
Schiedea adamantis	No common name	E#	O
S. apokremnos	No common name	E	K
S. haleakalensis	No common name	E	M
S. kaalae	No common name	E	O
S. lydgatei	No common name	E	Mo
S. spergulina var. *leiopoda*	No common name	E#	K
S. spergulina var. *spergulina*	No common name	T	K
Silene alexandri	No common name	E#	Mo
S. hawaiiensis	No common name	T	H
S. lanceolata	No common name	E	H, LX, Mo, O, KX
S. perlmanii	No common name	E#	O
Solanum sandwicense	Pōpolo ‘aiakeakua	E#	O, K
Stenogyne angustifolia	No common name	E	H, MX, MoX
S. bifida	No common name	E#	Mo
S. campanulata	No common name	E	K
S. kanehoana	No common name	E#	O
Tetramolopium arenarium ssp. *arenarium*	No common name	E#	H, MX
T. arenarium ssp. *laxum*	No common name	E*	MX
T. filiforme var. *filiforme*	No common name	E	O
T. filiforme var. *polyphyllum*	No common name	E#	O
T. lepidotum ssp. *lepidotum*	No common name	E#	LX, O
T. remyi	No common name	E#	MX, L
T. rockii var. *calcisabulorum*	No common name	T*	MoX
T. rockii var. *rockii*	No common name	T	Mo
Tetraplasandra gymnocarpa	‘Ohe‘ohe	E	O
Urera kaalae	Opuhe	E	O
Vicia menziesii	Hawaiian vetch	E	H
Viola chamissoniana ssp. *chamissoniana*	Pamakani	E	O
V. helenae	No common name	E	K
V. lanaiensis	No common name	E	L
Wilkesia hobdyi	Iliau	E	K
Xylosma crenatum	Maua	E#	K
Zanthoxylum hawaiiense	A‘e	E	H, M, LX, Mo, K

Proposed Taxa (33 taxa)

Adenophorus periens	Kihi	PE	H, Mo, K
Amaranthus brownii	No common name	PE#	N
Asplenium fragile var. *insulare*	No common name	PE	H, M
Bonamia menziesii	No common name	PE	H, M, L, MoX, O, K
Ctenitis squamigera	Pauoa	PE	M, L, Mo, O, KX
Delissea undulata ssp. *kauaiensis*	ʻŌhā	PE*	KX
D. undulata ssp. *niihauensis*	ʻŌhā	PE*	NiiX
D. undulata ssp. *undulata*	ʻŌhā	PE#	H, MX
Diellia erecta	No common name	PE	H, M, L, Mo, O, K
Diplazium molokaiense	No common name	PE#	M, L, Mo, O, KX
Flueggea neowawraea	Mehamehame	PE	H, M, MoX, O, K
Hibiscus brackenridgei ssp. *brackenridgei*	Maʻo hau hele	PE	H, M, L, MoX
H. brackenridgei ssp. *mokuleianus*	Maʻo hau hele	PE	O, KX
Mariscus pennatiformis ssp. *bryanii*	No common name	PE	La
M. pennatiformis ssp. *pennatiformis*	No common name	PE	HM, OX, K
Melicope adscendens	Alani	PE#	M
M. balloui	Alani	PE#	M
M. ovalis	Alani	PE	M
Neraudia sericea	Maʻaloa	PE	M, L, Mo, KaX
Plantago princeps var. *anomala*	Ale	PE	OX, K
P. princeps var. *laxiflora*	Ale	PE	HX, M, Mo
P. princeps var. *longibracteata*	Ale	PE	O, K
P. princeps var. *princeps*	Ale	PE	O
Poa mannii	Mann's bluegrass	PE	K
Pritchardia aylmer-robinsonii	Wāhane	PE#	Nii
P. remota	Loulu	PE	N
Pteris lidgatei	No common name	PE	M, MoX, O
Schiedea verticillata	No common name	PE	N
Sesbania tomentosa	ʻOhai	PE	H, M, L, Mo, O, K, Ka, NiiX
Solanum incompletum	Pōpolo	PE#	H, MX, LX, MoX, KX
Spermolepis hawaiiensis	No common name	PE	H, M, L, MoX, O, K
Tetramolopium capillare	No common name	PE	M
Vigna o-wahuensis	Oʻahu vigna	PE	HM, L, Mo, OX, Ka, Nii

Recommended Candidate 1 Taxa (85 taxa)

Achyranthes mutica	No common name	C1#	H, KX
Alsinidendron lychnoides	No common name	C1	K
A. viscosum	No common name	C1	K
Bidens micrantha ssp. *ctenophylla*	Ko‘oko‘olau	C1	H
Cenchrus agrimoniodies var. *agrimonioides*	No common name	C1	M, L, O
Chamaesyce herbstii	‘Akoko	C1	O
C. rockii	‘Akoko	C1	O
Clermontia drepanomorpha	‘Ōhā wai	C1	H
Cyanea acuminata	Hāhā	C1	O
C. copelandii ssp. *haleakalaensis*	Hāhā	C1	M
C. dunbarii	Hāhā	C1#	Mo
C. glabra	Hāhā	C1#	M
C. grimesiana ssp. *grimesiana*	Hāhā	C1	M, L, Mo, O
C. hamatiflora ssp. *hamatiflora*	Hāhā	C1#	M
C. kolekoleensis	Hāhā	C1#	K
C. sp. nov.	Hāhā	C1#	K
C. platyphylla	‘Akū‘akū	C1#	H
C. recta	Hāhā	C1	K
C. remyi	Hāhā	C1	K
Cyperus trachysanthos	No common name	C1	L, Mo, OX, KX, NiiX
C. cyaneoides	Ha‘iwale	C1	K
C. dentata	Ha‘iwale	C1#	O
C. subumbellata	Ha‘iwale	C1#	O
C. viridiflora	Ha‘iwale	C1#	O
Delissea rivularis	‘Ōhā	C1	K
D. subcordata	‘Ōhā	C1	O
Dubautia knudsenii ssp. *filiformis*	Na‘ena‘e	C1	K
D. plantaginea ssp. *humilis*	Na‘ena‘e	C1	M
Eragrostis fosbergii	No common name	C1#	O
Euphorbia haeleeleana	‘Akoko	C1	O, K
Fabaceae sp. nov.	No common name	C1#	Ka
Gardenia mannii	Nānū	C1	O
Hedyotis schlechtendahliana var. *remyi*	Kopa	C1#	L
Hibiscadelphus crucibracteatus	Hau kuahiwi	C1*	LX
H. giffardianus	Hau kuahiwi	C1*	HX
Hibiscadelphus hualalaiensis	Hau kuahiwi	C1*	HX
H. sp. nov.	Hau kuahiwi	C1#	K
Hibiscus waimeae ssp. *hannerae*	Koki‘o ke‘oke‘o	C1	K
Isodendrion laurifolium	Aupaka	C1	O, K
I. longifolium	Aupaka	C1	O, K
Kokia kauaiensis	Koki‘o	C1	K
Labordia cyrtandrae	Kāmakahala	C1#	O
L. tinifolia var. *wahiawaensis*	Kāmakahala	C1	K
L. triflora	Kāmakahala	C1#	L
Lepidium arbuscula	‘Anaunau	C1	O

Lipochaeta tenuis	Nehe	C1	O
Lobelia gaudichaudii ssp. *koolauensis*	No common name	C1	O
Lysimachia maxima (= *L. ternifolia*)	No common name	C1#	Mo
Melicope munroi	Alani	C1#	L
M. saint-johnii	Alani	C1	O
M. zahlbruckneri	Alani	C1#	H
Myrsine juddii	Kōlea	C1	O
M. linearifolia	Kōlea	C1	K
Neraudia ovata	Maʻoloa	C1#	H
Panicum niihauense	Lauʻehu	C1#	K, Nii
Phyllostegia hirsuta	No common name	C1	O
P. kaalaensis	No common name	C1#	O
P. knudsenii	No common name	C1#	K
P. parviflora var. *lydgatei*	No common name	C1	O
P. racemosa	Kīponapona	C1	H
P. velutina	No common name	C1	H
P. warshaueri	No common name	C1#	H
P. wawrana	No common name	C1#	K
Platanthera holochila	No common name	C1	M, Mo, OX, K
Pleomele hawaiiensis	Hala pepe	C1	H
Pritchardia kaalae	Loulu	C1	O
P. napaliensis	Loulu	C1	K
P. schattaueri	Loulu	C1#	H
P. viscosa	Loulu	C1#	K
Rollandia angustifolia	No common name	C1	O
R. humboldtiana	No common name	C1	O
R. longiflora	No common name	C1	O
R. st.-johnii	No common name	C1	O
Sanicula purpurea	No common name	C1	M, O
Schiedea helleri	No common name	C1#	K
S. hookeri	No common name	C1	MX, O
S. membranacea	No common name	C1	K
S. nuttallii	No common name	C1	O, K
S. sarmentosa	No common name	C1	Mo
S. stellarioides	Maʻoliʻoli	C1#	K
Sicyos alba	ʻĀnunu	C1	H
Trematolobelia singularis	No common name	C1	O
Viola kauaensis var. *wahiawaensis*	Nani Waiʻaleʻale	C1	K
V. oahuensis	No common name	C1	O
Zanthoxylum dipetalum var. *tomentosum*	Kaawaʻu	C1#	H

Candidate 2 Taxa (124 taxa)

Acacia koaia	Koaiʻe	C2	H, M, L, Mo, K
Asplenium schizophyllum	No common name	C2	H, M, K
Bidens campylotheca ssp. *pentamera*	Koʻokoʻolau	C2	M
B. campylotheca ssp. *waihoiensis*	Koʻokoʻolau	C2	M

B. conjuncta	Ko‘oko‘olau	C2	M
B. sandvicensis ssp. *confusa*	Ko‘oko‘olau	C2	K
Bobea timonioides	‘Ahakea	C2	H, M, O, K
Botrychium subbifoliatum	No common name	C2*	HX, MX, LX, MoX, OX, KX
Calamagrostis expansa	No common name	C2	M
Canavalia napaliensis	‘Āwikiwiki	C2	K
C. pubescens	‘Āwikiwiki	C2	M, L, K, Nii
Capparis sandwichiana	Pua pilo	C2	H, M, L, Mo, O, Ka, Nii, La, PH, Mi
Carex wahuensis ssp. *herbstii*	No common name	C2*	OX
Cenchrus agrimonioides var. *laysanensis*	Kāmanomano	C2*	LaX
Chamaesyce arnottiana	‘Akoko	C2	O
C. atrococca	‘Akoko	C2	K
C. celastroides var. *tomentella*	‘Akoko	C2*	OX
C. olowaluana	‘Akoko	C2	H, M
C. remyi var. *kauaiensis*	‘Akoko	C2	K
C. remyi var. *remyi*	‘Akoko	C2	K
C. skottsbergii var. *vaccinioides*	‘Akoko	C2	M, Mo, Ka
C. sparsiflora	‘Akoko	C2#	K
Charpentiera densiflora	Pāpala	C2	K
Cyanea kunthiana	Hāhā	C2	M
C. leptostegia	Hāhā	C2	K
C. longissima	Hāhā	C2*	MX
C. marksii	Hāhā	C2	H
C. tritomantha	‘Akū‘akū	C2	H
Cyrtandra biserrata	Ha‘iwale	C2	Mo
Cyrtandra filipes	Ha‘iwale	C2	M, Mo
C. halawensis	Ha‘iwale	C2	Mo
C. hematos	Ha‘iwale	C2	Mo
C. kealiae	Ha‘iwale	C2	K
C. lydgatei	Ha‘iwale	C2	M, L, Mo
C. macrocalyx	Ha‘iwale	C2	Mo
C. oenobarba	Ha‘iwale	C2	K
C. oxybapha	Ha‘iwale	C2	M
C. pickeringii	Ha‘iwale	C2	K
C. pruinosa	Ha‘iwale	C2*	OX
C. sandwicensis	Ha‘iwale	C2	O
C. sessilis	Ha‘iwale	C2	O
Dubautia arborea	Na‘ena‘e	C2	H
D. imbricata ssp. *acronaea*	Na‘ena‘e	C2	K
D. imbricata ssp. *imbricata*	Na‘ena‘e	C2	K
D. microcephala	Na‘ena‘e	C2	K
D. sherffiana	Na‘ena‘e	C2	O
Eragrostis deflexa	No common name	C2	H, LX
E. hosakae	No common name	C2*	MoX

Eurya sandwicensis	Ānini	C2	H, M, Mo, O, K
Exocarpos gaudichaudii	Heau	C2	HX, M, L, Mo, O, Ka, Nii
Festuca hawaiiensis	No common name	C2	H, M
Fimbristylis hawaiiensis	No common name	C2	H
Gardenia remyi	Nānū	C2	H, M, Mo, K
Geranium humile	Nohoanu	C2	M
G. kauaiense	Nohoanu	C2#	K
Gnaphalium sandwicensium var. *molokaiense*	‘Ena‘ena	C2	Mo
Hedyotis elatior	No common name	C2	M, Mo, O, K
H. fluviatilis	No common name	C2	O, K
H. formosa	No common name	C2	M
H. littoralis	No common name	C2	H, M, Mo, OX, K
H. tryblium	No common name	C2	K
Hibiscus kokio ssp. *kokio*	Pualoalo, koki‘o ‘ula‘ula	C2	H, M, Mo, O, K
H. kokio ssp. *saintjohnianus*	Pualoalo, koki‘o ‘ula‘ula	C2	K
Joinvillea ascendens ssp. *ascendens*	‘Ohe	C2	H, M, Mo, O, K
Korthalsella degeneri	Hulumoa	C2	O
Labordia helleri	Kāmakahala	C2	K
L. pumila	Kāmakahala	C2	K
Lepidium bidentatum var. *remyi*	‘Ānaunau	C2*	HX
L. serra	‘Ānaunau	C2	K
Lipochaeta degeneri	Nehe	C2*	MoX
Lobelia dunbarii ssp. *dunbarii*	‘Ōhā	C2*	MoX
L. dunbarii ssp. *paniculata*	‘Ōhā	C2	Mo
Lysimachia daphnoides	Kolokolo kuahiwi	C2	K
L. kalalauensis	No common name	C2	K
L. sp. A	No common name	C2	K
Mariscus kunthianus	No common name	C2	M
M. rockii	No common name	C2*	KX
Melicope christophersenii	Alani	C2	O
M. cruciata	Alani	C2*	KX
M. degeneri	Alnai	C2*	KX
M. haleakalae	Alani	C2	M
M. macropus	Alani	C2	K
M. nealae	Alani	C2*	KX
M. paniculata	Alani	C2	K
M. puberula	Alani	C2	K
M. wailauensis	Alani	C2*	MoX
Myrsine fosbergii	Kōlea	C2	O, K
M. mezii	Kōlea	C2	K
M. vaccinioides	Kōlea	C2	M
Peperomia degeneri	‘Ala‘ala wai nui	C2*	MoX
P. rockii	‘Ala‘ala wai nui	C2	Mo
P. subpetiolata	‘Ala‘ala wai nui	C2	M
Phyllostegia bracteata	No common name	C2	M

P. helleri	No common name	C2	K
P. imminuta	No common name	C2*	MX, LX
Pisonia wagneriana	Pāpala kēpau	C2	K
Pittosporum napaliense	Ho‘awa	C2	K
Platydesma cornuta	Pilo kea	C2	O
P. remyi	Pilo kea	C2	H
P. rostrata	Pilo kea	C2	K
Portulaca molokiniensis	‘Ihi	C2	M, Ka
P. villosa	‘Ihi	C2	H, M, L, Mo, O, Ka, Nii, N
Pritchardia hardyi	Loulu	C2	K
Psychotria hobdyi	Kōpiko	C2	K
Ranunculus hawaiensis	Makou	C2	H, M
R. mauiensis	Makou	C2	H, M, Mo, O, K
Rubus macraei	‘Ākala	C2	H, M
Sanicula kauaiensis	No common name	C2*	KX
S. sandwicensis	No common name	C2	H, M
Schiedea salicaria	No common name	C2	M
Sicyos cucumerinus	‘Ānunu	C2	H, M, Mo
S. macrophyllus	‘Ānunu	C2	H
Stenogyne cranwelliae	No common name	C2*	HX
S. haliakalae	No common name	C2*	MX
S. oxygona	No common name	C2*	HX
Tetramolopium consanguineum ssp. *leptophyllum*	No common name	C2	H
T. humile var. *sublaeve*	No common name	C2	H
Tetraplasandra kavaiensis	‘Ohe‘ohe	C2	H, L, O, K
Thelypteris boydiae	No common name	C2	H, M, O
Torulinium odoratum ssp. *auriculatum*	No common name	C2*	HX, MX, MoX, OX, KX
Trematolobelia grandifolia	No common name	C2	H
Wikstroemia bicornuta	‘Ākia	C2	M, L
W. skottsbergiana	‘Ākia	C2	K
W. villosa	‘Ākia	C2	M

Appendix I

— Alphabetical by Latin Name (dates in parenthesis indicate date of listing)

Abutilon eremitopetalum (9/20/91)	Hidden-petaled abutilon	E#
A. menziesii (9/26/86)	Koʻokoaʻula	E
A. sandwicense (10/29/91)	No common name	E
Acacia koaia	Koaiʻe	C2
Acaena exigua (5/15/92)	Liliwai	E*
Achyranthes mutica	No common name	C1#
A. splendens var. *rotundata* (3/26/86)	No common name	E
Adenophorus periens	Kihi	PE
Alectryon macrococcus var. *auwahiensis* (5/15/92)	Māhoe	E#
A. macrococcus var. *macrococcus* (5/15/92)	Māhoe	E
Alsinidendron lychnoides	No common name	C1
A. obovatum (10/29/91)	No common name	E
A. trinerve (10/29/91)	No common name	E#
A. viscosum	No common name	C1
Amaranthus brownii	No common name	PE#
Argyroxiphium kauense (4/7/93)	Kaʻu silversword	E
A. sandwicense ssp. *macrocephalum* (5/15/92)	Haleakalā silversword	T
A. sandwicense ssp. *sandwicense* (3/21/88)	Mauna Kea silversword	E
Asplenium fragile var. *insulare*	No common name	PE
A. schizophyllum	No common name	C2
Bidens campylotheca ssp. *pentamera*	Koʻokoʻolau	C2
B. campylotheca ssp. *waihoiensis*	Koʻokoʻolau	C2
B. conjuncta	Koʻokoʻolau	C2
B. cuneata (2/17/84)	Koʻokoʻolau	E
B. micrantha ssp. *ctenophylla*	Koʻokoʻolau	C1
B. micrantha ssp. *kalealaha* (5/15/92)	Koʻokoʻolau	E
B. sandvicensis ssp. *confusa*	Koʻokoʻolau	C2
B. wiebkei (10/8/92)	Koʻokoʻolau	E
Bobea timonioides	ʻAhakea	C2
Bonamia menziesii	No common name	PE
Botrychium subbifoliatum	No common name	C2*
Brighamia insignis (2/25/94)	ʻŌlulu	E
B. rockii (10/8/92)	Ālulu	E
Caesalpinia kavaiensis (7/8/86)	Uhiuhi	E
Calamagrostis expansa	No common name	C2
Canavalia molokaiensis (10/8/92)	ʻĀwikiwiki	E
C. napaliensis	ʻĀwikiwiki	C2
C. pubescens	ʻĀwikiwiki	C2
Capparis sandwichiana	Pua pilo	C2
Carex wahuensis ssp. *herbstii*	No common name	C2*
Cenchrus agrimoniodies var. *agrimonioides*	No common name	C1

C. agrimonioides var. *laysanensis*	Kāmanomano	C2*
Centaurium sebaeoides (10/29/91)	‘Āwiwi	E
Chamaesyce arnottiana	‘Akoko	C2
C. atrococca	‘Akoko	C2
C. celastroides var. *kaenana* (10/29/91)	‘Akoko	E
C. celastroides var. *tomentella*	‘Akoko	C2*
C. deppeana (3/28/94)	‘Akoko	E#
C. halemanui (5/13/92)	‘Akoko	E
C. herbstii	‘Akoko	C1
C. kuwaleana (10/29/91)	‘Akoko	E
C. olowaluana	‘Akoko	C2
C. remyi var. *kauaiensis*	‘Akoko	C2
C. remyi var. *remyi*	‘Akoko	C2
C. rockii	‘Akoko	C1
C. skottsbergii var. *skottsbergii* (8/24/82)	‘Akoko	E
C. skottsbergii var. *vaccinioides*	‘Akoko	C2
C. sparsiflora	‘Akoko	C2#
Charpentiera densiflora	Pāpala	C2
Clermontia drepanomorpha	‘Ōhā wai	C1
C. lindseyana (3/4/94)	‘Ōhā wai	E
C. oblongifolia ssp. *brevipes* (10/8/92)	‘Ōhā wai	E#
C. oblongifolia ssp. *mauiensis* (5/15/92)	‘Ōhā wai	E#
C. peleana ssp. *peleana* (3/4/94)	‘Ōhā wai	E#
C. peleana ssp. *singulifolia* (3/4/94)	‘Ōhā wai	E*
C. pyrularia (3/4/94)	‘Ōhā wai	E#
Colubrina oppositifolia (3/4/94)	Kauila	E
Ctenitis squamigera	Pauoa	PE
Cyanea acuminata	Hāhā	C1
C. asarifolia (2/25/94)	Hāhā	E#
C. copelandii ssp. *copelandii* (3/4/94)	Hāhā	E#
C. copelandii ssp. *haleakalaensis*	Hāhā	C1
C. dunbarii	Hāhā	C1#
C. glabra	Hāhā	C1#
C. grimesiana ssp. *grimesiana*	Hāhā	C1
C. grimesiana ssp. *obatae* (6/27/94)	Hāhā	E#
C. hamatiflora ssp. *carlsonii* (3/4/94)	Hāhā	E#
C. hamatiflora ssp. *hamatiflora*	Hāhā	C1#
C. kolekoleensis	Hāhā	C1#
C. kunthiana	Hāhā	C2
C. leptostegia	Hāhā	C2
C. lobata (5/15/92)	Hāhā	E*
C. longissima	Hāhā	C2*
C. macrostegia ssp. *gibsonii* (9/20/91)	Hāhā	E
C. mannii (10/8/92)	Hāhā	E
C. marksii	Hāhā	C2
C. mceldowneyi (5/15/92)	Hāhā	E
C. pinnatifida (10/29/91)	Hāhā	E#

C. platyphylla	‘Akū‘ak‘ū	C1#
C. procera (10/8/92)	Hāhā	E
C. recta	Hāhā	C1
C. remyi	Hāhā	C1
C. shipmanii (3/4/94)	Hāhā	E#
C. sp. nov.	Hāhā	C1#
C. stictophylla (3/4/94)	Hāhā	E#
C. superba ssp. *regina* (9/11/91)	Hāhā	E*
C. superba ssp. *superba* (9/11/91)	Hāhā	E#
C. tritomantha	‘Akū‘akū	C2
C. truncata (3/28/94)	Hāhā	E
C. undulata (9/20/91)	Hāhā	E
Cyperuss trachysanthos	No common name	C1
Cyrtandra biserrata	Ha‘iwale	C2
C. crenata (3/28/94)	Ha‘iwale	E*
C. cyaneoides	Ha‘iwale	C1
C. dentata	Ha‘iwale	C1#
C. filipes	Ha‘iwale	C2
C. giffardii (3/4/94)	Ha‘iwale	E
C. halawensis	Ha‘iwale	C2
C. hematos	Ha‘iwale	C2
C. kealiae	Ha‘iwale	C2
C. limahuliensis (2/25/94)	Ha‘iwale	T
C. lydgatei	Ha‘iwale	C2
C. macrocalyx	Ha‘iwale	C2
C. munroi (5/15/92)	Ha‘iwale	E#
C. oenobarba	Ha‘iwale	C2
C. oxybapha	Ha‘iwale	C2
C. pickeringii	Ha‘iwale	C2
C. polyantha (3/28/94)	Ha‘iwale	E
C. pruinosa	Ha‘iwale	C2*
C. sandwicensis	Ha‘iwale	C2
C. sessilis	Ha‘iwale	C2
C. subumbellata	Ha‘iwale	C1#
C. tintinnabula (3/4/94)	Ha‘iwale	E
C. viridiflora	Ha‘iwale	C1#
Delissea rhytidosperma (2/25/94)	‘Ōhā	E#
D. rivularis	‘Ōhā	C1
D. subcordata	‘Ōhā	C1
D. undulata ssp. *kauaiensis*	‘Ōhā	PE*
D. undulata ssp. *niihauensis*	‘Ōhā	PE*
D. undulata ssp. *undulata*	‘Ōhā	PE#
Diellia erecta	No common name	PE
D. falcata (10/29/91)	No common name	E
D. pallida (proposed as *D. laciniata*) (2/25/94)	No common name	E#
D. unisora (6/27/94)	No common name	E#
Diplazium molokaiense	No common name	PE#

Dubautia arborea	Na‘ena‘e	C2
D. herbstobatae (10/29/91)	Na‘ena‘e	E
D. imbricata ssp. *acronaea*	Na‘ena‘e	C2
D. imbricata ssp. *imbricata*	Na‘ena‘e	C2
D. knudsenii ssp. *filiformis*	Na‘ena‘e	C1
D. latifolia (5/13/94)	Na‘ena‘e	E
D. microcephala	Na‘ena‘e	C2
D. pauciflorula (9/20/91)	Na‘ena‘e	E
D. plantaginea ssp. *humilis*	Na‘ena‘e	C1
D. sherffiana	Na‘ena‘e	C2
Eragrostis deflexa	No common name	C2
E. fosbergii	No common name	C1#
E. hosakae	No common name	C2*
Eugenia koolauensis (3/28/94)	Nīoi	E
Euphorbia haeleeleana	‘Akoko	C1
Eurya sandwicensis	Ānini	C2
Exocarpos gaudichaudii	Heau	C2
E. luteolus (2/25/94)	Heau	E
Fabaceae sp. nov.	No common name	C1#
Festuca hawaiiensis	No common name	C2
Fimbristylis hawaiiensis	No common name	C2
Flueggea neowawraea	Mehamehame	PE
Gahnia lanaiensis (9/20/91)	No common name	E
Gardenia brighamii (8/21/85)	Nā‘ū	E
G. mannii	Nānū	C1
G. remyi	Nānū	C2
Geranium arboreum (5/13/92)	Nohoanu	E
G. humile	Nohoanu	C2
G. kauaiense	Nohoanu	C2#
G. multiflorum (5/15/92)	Nohoanu	E
Gnaphalium sandwicensium var. *molokaiense*	‘Ena‘ena	C2
Gouania hillebrandii (CH) (11/9/84)	No common name	E
G. meyenii (10/29/91)	No common name	E
G. vitifolia (6/27/94	No common name	E#
Haplostachys haplostachya (10/30/79)	No common name	E
Hedyotis cookiana (2/25/94)	‘Āwiwi	E
H. coriacea (5/15/92)	No common name	E
H. degeneri var. *coprosmifolia* (10/29/91)	No common name	E#
H. degeneri var. *degeneri* (10/29/91)	No common name	E#
H. elatior	No common name	C2
H. fluviatilis	No common name	C2
H. formosa	No common name	C2
H. littoralis	No common name	C2
H. mannii (10/8/92)	No common name	E
H. parvula (10/29/91)	No common name	E#
H. schlechtendahliana var. *remyi*	Kopa	C1#
H. st.-johnii (9/30/91)	No common name	E

H. tryblium	No common name	C2
Hesperomannia arborescens (3/28/94)	No common name	E
H. arbuscula (10/29/91)	No common name	E
H. lydgatei (9/20/91)	No common name	E
Hibiscadelphus crucibracteatus	Hau kuahiwi	C1*
H. distans (4/29/86)	Hau kuahiwi	E
H. giffardianus	Hau kuahiwi	C1*
H. hualalaiensis	Hau kuahiwi	C1*
H. sp. nov.	Hau kuahiwi	C1#
Hibiscus arnottianus ssp. *immaculatus* (10/8/92)	Ke‘oke‘o	E
H. brackenridgei ssp. *brackenridgei*	Ma‘o hau hele	PE
H. brackenridgei ssp. *mokuleianus*	Ma‘o hau hele	PE
H. clayi (2/28/94)	Koi‘o ‘ula‘ula	E#
H. kokio ssp. *kokio*	Pualoalo, koki‘o ‘ula‘ula	C2
H. kokio ssp. *saintjohnianus*	Pualoalo, koki‘o ‘ula‘ula	C2
H. waimeae ssp. *hannerae*	Koki‘o ke‘oke‘o	C1
Huperzia mannii (listed as *Lycopodium mannii*) (5/15/92)	Wawae‘iole	E
H. nutans (listed as *Lycopodium nutans*) (3/28/94)	Wawae‘iole	E
Ischaemum byrone (3/4/94)	Hilo ischaemum	E
Isodendrion hosakae (1/14/91)	Aupaka	E#
I. laurifolium	Aupaka	C1
I. longifolium	Aupaka	C1
I. pyrifolium (3/4/94)	Aupaka	E#
Joinvillea ascendens ssp. *ascendens*	‘Ohe	C2
Kokia cookei (10/30/79)	Cooke’s koki‘o	E*
K. drynarioides (CH) (12/14/84)	Hau hele‘ula	E#
K. kauaiensis	Koki‘o	C1
Korthalsella degeneri	Hulumoa	C2
Labordia cyrtandrae	Kāmakahala	C1#
L. helleri	Kāmakahala	C2
L. lydgatei (9/20/91)	Kāmakahala	E#
L. pumila	Kāmakahala	C2
L. tinifolia var. *wahiawaensis*	Kāmakahala	C1
L. triflora	Kāmakahala	C1#
Lepidium arbuscula	‘Ānaunau	C1
L. bidentatum var. *remyi*	‘Ānaunau	C2*
L. serra	‘Ānaunau	C2
Lipochaeta degeneri	Nehe	C2*
L. fauriei (2/25/94)	Nehe	E
L. kamolensis (5/15/92)	Nehe	E
L. lobata var. *leptophylla* (10/29/91)	Nehe	E#
L. micrantha var. *exigua* (2/25/94)	Nehe	E
L. micrantha var. *micrantha* (2/25/94)	Nehe	E
L. tenuifolia (10/29/91)	Nehe	E
L. tenuis	Nehe	C1
L. venosa (10/30/79)	Nehe	E
L. waimeaensis (2/25/94)	Nehe	E#

Lobelia dunbarii ssp. *dunbarii*	‘Ōhā	C2*
L. dunbarii ssp. *paniculata*	‘Ōhā	C2
L. gaudichaudii ssp. *koolauensis*	No common name	C1
L. niihauensis (10/29/91)	‘Ōhā	E
L. oahuensis (3/28/94)	‘Ōhā	E
Lysimachia daphnoides	Kolokolo kuahiwi	C2
L. filifolia (2/25/94)	No common name	E
L. kalalauensis	No common name	C2
L. lydgatei (5/15/92)	No common name	E#
L. maxima (= *L. ternifolia*)	No common name	C1#
L. sp. A	No common name	C2
Mariscus fauriei (3/4/94)	No common name	E
M. kunthianus	No common name	C2
M. pennatiformis ssp. *bryanii*	No common name	PE
M. pennatiformis ssp. *pennatiformis*	No common name	PE
M. rockii	No common name	C2*
Marsilea villosa (6/22/92)	‘Ihi‘ihi	E
Melicope balloui	Alani	PE#
M. adscendens	Alani	PE#
M. christophersenii	Alani	C2
M. cruciata	Alani	C2*
M. degeneri	Alnai	C2*
M. haleakalae	Alani	C2
M. haupuensis (2/25/94)	Alani	E#
M. knudsenii (2/25/94)	Alani	E#
M. lydgatei (3/28/94)	Alani	E#
M. macropus	Alani	C2
M. mucronulata (5/15/92)	Alani	E#
M. munroi	Alani	C1#
M. nealae	Alani	C2*
M. ovalis	Alani	PE
M. pallida (2/25/94)	Alani	E
M. paniculata	Alani	C2
M. puberula	Alani	C2
M. quadrangularis (2/25/94)	Alani	E#
M. reflexa (10/8/92)	Alani	E
M. saint-johnii	Alani	C1
M. wailauensis	Alani	C2*
M. zahlbruckneri	Alani	C1#
Munroidendron racemosum (2/25/94)	No common name	E
Myrsine fosbergii	Kōlea	C2
M. juddii	Kōlea	C1
M. linearifolia	Kōlea	C1
M. mezii	Kōlea	C2
M. vaccinioides	Kōlea	C2
Neraudia angulata var. *angulata* (10/29/91)	Ma‘aloa	E#
N. angulata var. *dentata* (10/29/91)	Ma‘aloa	E

N. ovata	Ma'oloa	C1#
N. sericea	Ma'aloa	PE
Nothocestrum breviflorum (3/4/94)	'Aiea	E
N. peltatum (2/25/94)	'Aiea	E
Nototrichium humile (10/29/91)	Kulu'ī	E
Ochrosia kilaueaensis (3/4/94)	Hōlei	E*
Panicum fauriei var. *carteri* (CH) (10/12/83)	Carter's panicgrass	E
P. niihauense	Lau'ehu	C1#
Peperomia degeneri	'Ala'ala wai nui	C2*
P. rockii	'Ala'ala wai nui	C2
P. subpetiolata	'Ala'ala wai nui	C2
Peucedanum sandwicense (2/25/94)	Makou	T
Phyllostegia bracteata	No common name	C2
P. glabra var. *lanaiensis* (9/20/91)	No common name	E*
P. helleri	No common name	C2
P. hirsuta	No common name	C1
P. imminuta	No common name	C2*
P. kaalaensis	No common name	C1#
P. knudsenii	No common name	C1#
P. mannii (10/8/92)	No common name	E#
P. mollis (10/29/91)	No common name	E
P. parviflora var. *lydgatei*	No common name	C1
P. racemosa	Kīponapona	C1
P. velutina	No common name	C1
P. waimeae (2/25/94)	No common name	E
P. warshaueri	No common name	C1#
P. wawrana	No common name	C1#
Pisonia wagneriana	Pāpala kēpau	C2
Pittosporum napaliense	Hō'awa	C2
Plantago hawaiensis (3/4/94)	Laukahi kuahiwi	E#
P. princeps var. *anomala*	Ale	PE
P. princeps var. *laxiflora*	Ale	PE
P. princeps var. *longibracteata*	Ale	PE
P. princeps var. *princeps*	Ale	PE
Platanthera holochila	No common name	C1
Platydesma cornuta	Pilo kea	C2
P. remyi	Pilo kea	C2
P. rostrata	Pilo kea	C2
Pleomele hawaiiensis	Hala pepe	C1
Poa mannii	Mann's bluegrass	PE
P. sandvicensis (5/13/92)	No common name	E
P. siphonoglossa (5/13/92)	No common name	E
Portulaca molokiniensis	'Ihi	C2
P. sclerocarpa (3/4/94)	'Ihi	E
P. villosa	'Ihi	C2
Pritchardia affinis (3/4/94)	Loulu	E
P. aylmer-robinsonii	Wāhane	PE#

P. hardyi	Loulu	C2
P. kaalae	Loulu	C1
P. munroi (10/8/92)	Loulu	E#
P. napaliensis	Loulu	C1
P. remota	Loulu	PE
P. schattaueri	Loulu	C1#
P. viscosa	Loulu	C1#
Psychotria hobdyi	Kōpiko	C2
Pteralyxia kauaiensis (2/25/94)	Kaulu	E
Pteris lidgatei	No common name	PE
Ranunculus hawaiensis	Makou	C2
R. mauiensis	Makou	C2
Remya kauaiensis (1/14/91)	No common name	E
R. mauiensis (1/14/91)	No common name	E#
R. montgomeryi (1/14/91)	No common name	E#
Rollandia angustifolia	No common name	C1
R. crispa (3/28/94)	‘Ōhā	E
R. humboldtiana	No common name	C1
R. longiflora	No common name	C1
R. st.-johnii	No common name	C1
Rubus macraei	‘Ākala	C2
Sanicula kauaiensis	No common name	C2*
S. mariversa (10/29/91)	No common name	E
S. purpurea	No common name	C1
S. sandwicensis	No common name	C2
Santalum freycinetianum var. *lanaiense* (1/24/86)	‘Iliahi	E
Scaevola coriacea (5/16/86)	Dwarf naupaka	E
Schiedea adamantis (2/17/84)	No common name	E#
S. apokremnos (9/30/91)	No common name	E
S. haleakalensis (5/15/92)	No common name	E
S. helleri	No common name	C1#
S. hookeri	No common name	C1
S. kaalae (10/29/91)	No common name	E
S. lydgatei (10/8/92)	No common name	E
S. membranacea	No common name	C1
S. nuttallii	No common name	C1
S. salicaria	No common name	C2
S. sarmentosa	No common name	C1
S. spergulina var. *leiopoda* (2/25/94)	No common name	E#
S. spergulina var. *spergulina* (2/25/94)	No common name	T
S. stellarioides	Mā‘oli‘oli	C1#
S. verticillata	No common name	PE
Sesbania tomentosa	‘Ohai	PE
Sicyos alba	‘Ānunu	C1
S. cucumerinus	‘Ānunu	C2
S. macrophyllus	‘Ānunu	C2
Silene alexandri (10/8/92)	No common name	E#

S. hawaiiensis (3/4/94)	No common name	T
S. lanceolata (10/8/92)	No common name	E
S. perlmanii (10/29/91)	No common name	E#
Solanum incompletum	Pōpolo	PE#
S. sandwicense (2/25/94)	Pōpolo ‘aiakeakua	E#
Spermolepis hawaiiensis	No common name	PE
Stenogyne angustifolia (10/30/79)	No common name	E
S. bifida (10/8/92)	No common name	E#
S. campanulata (5/13/92)	No common name	E
S. cranwelliae	No common name	C2*
S. haliakalae	No common name	C2*
S. kanehoana (5/13/92)	No common name	E#
S. oxygona	No common name	C2*
Tetramolopium arenarium ssp. *arenarium* (3/4/94)	No common name	E#
T. arenarium ssp. *laxum* (3/4/94)	No common name	E*
T. capillare	No common name	PE
T. consanguineum ssp. *leptophyllum*	No common name	C2
T. filiforme var. *filiforme* (10/29/91)	No common name	E
T. filiforme var. *polyphyllum* (10/29/91)	No common name	E#
T. humile var. *sublaeve*	No common name	C2
T. lepidotum ssp. *lepidotum* (10/29/91)	No common name	E#
T. remyi (9/20/91)	No common name	E#
T. rockii var. *calcisabulorum* (10/8/92)	No common name	T*
T. rockii var. *rockii* (10/8/92)	No common name	T
Tetraplesandra gymnocarpa (3/28/94)	‘Ohe‘ohe	E
T. kavaiensis	‘Ohe‘ohe	C2
Thelypteris boydiae	No common name	C2
Torulinium odoratum ssp. *auriculatum*	No common name	C2*
Trematolobelia grandifolia	No common name	C2
T. singularis	No common name	C1
Urera kaalae (10/29/91)	Opuhe	E
Vicia menziesii (4/26/78)	Hawaiian vetch	E
Vigna o-wahuensis	O‘ahu vigna	PE
Viola chamissoniana ssp. *chamissoniana* (10/29/91)	Pāmakani	E
V. helenae (9/20/91)	No common name	E
V. kauaensis var. *wahiawaensis*	Nani Wai‘ale‘ale	C1
V. lanaiensis (9/20/91)	No common name	E
V. oahuensis	No common name	C1
Wikstroemia bicornuta	‘Ākia	C2
W. skottsbergiana	‘Ākia	C2
W. villosa	‘Ākia	C2
Wilkesia hobdyi (6/22/92)	Iliau	E
Xylosma crenatum (5/13/92)	Maua	E#
Zanthoxylum dipetalum var. *tomentosum*	Kaawau	C1#
Z. hawaiiense (3/4/94)	A‘e	E

Appendix II

— Aphabetical by Common Name

A‘e	*Zanthoxylum hawaiiense*	E
‘Ahakea	*Bobea timonioides*	C2
‘Aiea	*Nothocestrum breviflorum*	E
	N. peltatum	E
‘Ākala	*Rubus macraei*	C2
‘Ākia	*Wikstroemia bicornuta*	C2
	W. skottsbergiana	C2
	W. villosa	C2
‘Akoko	*Chamaesyce arnottiana*	C2
	C. atrococca	C2
	C. celastroides var. *kaenana*	E
	C. celastroides var. *tomentella*	C2*
	C. deppeana	E#
	C. halemanui	E
	C. herbstii	C1
	C. kuwaleana	E
	C. olowaluana	C2
	C. remyi var. *kauaiensis*	C2
	C. remyi var. *remyi*	C2
	C. rockii	C1
	C. sparsiflora	C2#
	C. skottsbergii var. *skottsbergii*	E
	C. skottsbergii var. *vaccinioides*	C2
	Euphorbia haeleeleana	C1
‘Akū‘akū	*Cyanea platyphylla*	C1#
	C. tritomantha	C2
‘Ala‘ala wai nui	*Peperomia degeneri*	C2*
	P. rockii	C2
	P. subpetiolata	C2
Alani	*Melicope adscendens*	PE#
	M. balloui	PE#
	M. christophersenii	C2
	M. cruciata	C2*
	M. degeneri	C2*

	M. haleakalae	C2
	M. haupuensis	E#
	M. knudsenii	E#
	M. lydgatei	E#
	M. macropus	C2
	M. mucronulata	E#
	M. munroi	C1#
	M. nealae	C2*
	M. ovalis	PE
	M. pallida	E
	M. paniculata	C2
	M. puberula	C2
	M. quadrangularis	E#
	M. reflexa	E
	M. saint-johnii	C1
	M. wailauensis	C2*
	M. zahlbruckneri	C1#
Ale	*Plantago princeps* var. *anomala*	PE
	P. princeps var. *laxiflora*	PE
	P. princeps var. *longibracteata*	PE
	P. princeps var. *princeps*	PE
Ālulu	*Brighamia rockii*	E
‘Ānaunau	*Lepidium arbuscula*	C1
	L. bidentatum var. *remyi*	C2*
	L. serra	C2
Ānini	*Eurya sandwicensis*	C2
‘Ānunu	*Sicyos alba*	C1
	S. cucumerinus	C2
	S. macrophyllus	C2
Aupaka	*Isodendrion hosakae*	E#
	I. laurifolium	C1
	I. longifolium	C1
	I. pyrifolium	E#
‘Āwikiwiki	*Canavalia molokaiensis*	E
	C. napaliensis	C2
	C. pubescens	C2
‘Āwiwi	*Centaurium sebaeoides*	E
	Hedyotis cookiana	E

Carter's panicgrass	*Panicum fauriei* var. *carteri* (CH)	E
Cooke's koki'o	*Kokia cookei*	E*
Dwarf naupaka	*Scaevola coriacea*	E
‘Ena‘ena	*Gnaphalium sandwicensium* var. *molokaiense*	C2
Hāhā	*Cyanea acuminata*	C1
	C. asarifolia	E#
	C. copelandii ssp. *copelandii*	E#
	C. copelandii ssp. *haleakalaensis*	C1
	C. dunbarii	C1#
	C. glabra	C1#
	C. grimesiana ssp. *grimesiana*	C1
	C. grimesiana ssp. *obatae*	E#
	C. hamatiflora ssp. *carlsonii*	E#
	C. hamatiflora ssp. *hamatiflora*	C1#
	C. kolekoleensis	C1#
	C. kunthiana	C2
	C. leptostegia	C2
	C. lobata	E*
	C. longissima	C2*
	C. macrostegia ssp. *gibsonii*	E
	C. mannii	E
	C. marksii	C2
	C. mceldowneyi	E
	C. pinnatifida	E#
	C. procera	E
	C. recta	C1
	C. remyi	C1
	C. stictophylla	E#
	C. shipmanii	E#
	C. sp. nov.	C1#
	C. superba ssp. *regina*	E*
	C. superba ssp. *superba*	E#
	C. truncata	E
	C. undulata	E
Ha‘iwale	*Cyrtandra biserrata*	C2
	C. crenata	E*
	C. cyaneoides	C1
	C. dentata	C1#
	C. filipes	C2
	C. giffardii	E
	C. halawensis	C2
	C. hematos	C2

	C. kealiae	C2
	C. limahuliensis	T
	C. lydgatei	C2
	C. macrocalyx	C2
	C. munroi	E#
	C. oenobarba	C2
	C. oxybapha	C2
	C. pickeringii	C2
	C. polyantha	E
	C. pruinosa	C2*
	C. sandwicensis	C2
	C. sessilis	C2
	C. subumbellata	C1#
	C. tintinnabula	E
	C. viridiflora	C1#
Hala pepe	*Pleomele hawaiiensis*	C1
Haleakalā silversword	*Argyroxiphium sandwicense* ssp. *macrocephalum*	T
Hau hele ‘ula	*Kokia drynarioides* (CH)	E#
Hau kuahiwi	*Hibiscadelphus crucibracteatus*	C1*
	H. distans	E
	H. giffardianus	C1*
	H. hualalaiensis	C1*
	H. sp. nov.	C1#
Hawaiian vetch	*Vicia menziesii*	E
Heau	*Exocarpos gaudichaudii*	C2
	E. luteolus	E
Hidden-petaled abutilon	*Abutilon eremitopetalum*	E#
Hilo ischaemum	*Ischaemum byrone*	E
Hō‘awa	*Pittosporum napaliense*	C2
Hōlei	*Ochrosia kilaueaensis*	E*
Hulumoa	*Korthalsella degeneri*	C2
‘Ihi	*Portulaca molokiniensis*	C2
	P. sclerocarpa	E
	P. villosa	C2

‘Ihi‘ihi	*Marsilea villosa*	E
‘Iliahi	*Santalum freycinetianum* var. *lanaiense*	E
Iliau	*Wilkesia hobdyi*	E
Kaawau	*Zanthoxylum dipetalum* var. *tomentosum*	C1#
Kāmakahala	*Labordia cyrtandrae*	C1#
	L. helleri	C2
	L. lydgatei	E#
	L. pumila	C2
	L. tinifolia var. *wahiawaensis*	C1
	L. triflora	C1#
Kāmanomano	*Cenchrus agrimonioides* var. *laysanensis*	C2*
Ka‘ū silversword	*Argyroxiphium kauense*	E
Kauila	*Colubrina oppositifolia*	E
Kaulu	*Pteralyxia kauaiensis*	E
Ke‘oke‘o	*Hibiscus arnottianus* ssp. *immaculatus*	E
Kihi	*Adenophorus periens*	PE
Kīponapona	*Phyllostegia racemosa*	C1
Koai‘e	*Acacia koaia*	C2
Koki‘o	*Kokia kauaiensis*	C1
Koki‘o ke‘oke‘o	*Hibiscus waimeae* ssp. *hannerae*	C1
Koi‘o ‘ula‘ula	*Hibiscus clayi*	E#
	H. kokio ssp. *kokio*	C2
	H. kokio ssp. *saintjohnianus*	C2
Kōlea	*Myrsine fosbergii*	C2
	M. juddii	C1
	M. linearifolia	C1
	M. mezii	C2

	M. vaccinioides	C2
Kolokolo kuahiwi	*Lysimachia daphnoides*	C2
Ko‘okoa‘ula	*Abutilon menziesii*	E
Ko‘oko‘olau	*Bidens campylotheca* ssp. *pentamera*	C2
	B. campylotheca ssp. *waihoiensis*	C2
	B. conjuncta	C2
	B. cuneata	E
	B. micrantha ssp. *ctenophylla*	C1
	B. micrantha ssp. *kalealaha*	E
	B. sandvicensis ssp. *confusa*	C2
	B. wiebkei	E
Kopa	*Hedyotis schlechtendahliana* var. *remyi*	C1#
Kōpiko	*Psychotria hobdyi*	C2
Kulu‘ī	*Nototrichium humile*	E
Lau‘ehu	*Panicum niihauense*	C1#
Laukahi kuahiwi	*Plantago hawaiensis*	E#
Liliwai	*Acaena exigua*	E*
Loulu	*Pritchardia affinis*	E
	P. hardyi	C2
	P. kaalae	C1
	P. munroi	E#
	P. napaliensis	C1
	P. remota	PE
	P. schattaueri	C1#
	P. viscosa	C1#
Ma‘aloa	*Neraudia angulata* var. *dentata*	E
	N. angulata var. *angulata*	E#
	N. sericea	PE
Māhoe	*Alectryon macrococcus* var. *auwahiensis*	E#
	A. macrococcus var. *macrococcus*	E

Makou	*Peucedanum sandwicense*	T
	Ranunculus hawaiensis	C2
	R. mauiensis	C2
Mann's bluegrass	*Poa mannii*	PE
Ma‘o hau hele	*Hibiscus brackenridgei* ssp. *brackenridgei*	PE
	H. brackenridgei ssp. *mokuleianus*	PE
Mā‘oli‘oli	*Schiedea stellarioides*	C1#
Ma‘oloa	*Neraudia ovata*	C1#
Maua	*Xylosma crenatum*	E#
Mauna Kea silversword	*Argyroxiphium sandwicense* ssp. *sandwicense*	E
Mehamehame	*Flueggea neowawraea*	PE
Na‘ena‘e	*Dubautia arborea*	C2
	D. herbstobatae	E
	D. imbricata ssp. *acronaea*	C2
	D. imbricata ssp. *imbricata*	C2
	D. knudsenii ssp. *filiformis*	C1
	D. latifolia	
	D. microcephala	C2
	D. pauciflorula	E
	D. plantaginea ssp. *humilis*	C1
	D. sherffiana	C2
Nani Wai‘ale‘ale	*Viola kauaensis* var. *wahiawaensis*	C1
Nānū	*Gardenia remyi*	C
	G. mannii	C1
Nā‘ū	*Gardenia brighamii*	E
Nehe	*Lipochaeta degeneri*	C2*
	L. fauriei	E
	L. kamolensis	E
	L. lobata var. *leptophylla*	E#
	L. micrantha var. *exigua*	E
	L. micrantha var. *micrantha*	E
	L. tenuifolia	E

	L. tenuis	C1
	L. venosa	E
	L. waimeaensis	E#
Nīoi	*Eugenia koolauensis*	E
Nohoanu	*Geranium arboreum*	E
	G. humile	C2
	G. kauaiense	C2#
	G. multiflorum	E
Oʻahu vigna	*Vigna o-wahuensis*	PE
ʻŌhā	*Delissea rhytidosperma*	E#
	D. rivularis	C1
	D. subcordata	C1
	D. undulata ssp. *kauaiensis*	PE*
	D. undulata ssp. *niihauensis*	PE*
	D. undulata ssp. *undulata*	PE#
	Lobelia dunbarii ssp. *dunbarii*	C2*
	L. dunbarii ssp. *paniculata*	C2
	L. niihauensis	E
	L. oahuensis	E
	Rollandia crispa	E
ʻŌhā wai	*Clermontia drepanomorpha*	C1
	C. lindseyana	E
	C. oblongifolia ssp. *brevipes*	E#
	C. oblongifolia ssp. *mauiensis*	E#
	C. peleana ssp. *peleana*	E#
	C. peleana ssp. *singulifolia*	E*
	C. pyrularia	E#
ʻOhai	*Sesbania tomentosa*	PE
ʻOhe	*Joinvillea ascendens* ssp. *ascendens*	C2
ʻOheʻohe	*Tetraplasandra gymnocarpa*	E
	T. kavaiensis	C2
ʻŌlulu	*Brighamia insignis*	E
Ōpuhe	*Urera kaalae*	E
Pāmakani	*Viola chamissoniana* ssp. *chamissoniana*	E

Pāpala	*Charpentiera densiflora*	C2
Pāpala kēpau	*Pisonia wagneriana*	C2
Pauoa	*Ctenitis squamigera*	PE
Pilo kea	*Platydesma cornuta*	C2
	P. remyi	C2
	P. rostrata	C2
Pōpolo	*Solanum incompletum*	PE#
Pōpolo ‘aiakeakua	*Solanum sandwicense*	E#
Pua pilo	*Capparis sandwichiana*	C2
Pualoalo	*Hibiscus kokio* ssp. *kokio*	C2
	H. kokio ssp. *saintjohnianus*	C2
Uhiuhi	*Caesalpinia kavaiensis*	E
Wāhane	*Pritchardia aylmer-robinsonii*	PE#
Wawae‘iole	*Huperzia nutans* (listed as *Lycopodium nutans*)	E
	H. mannii (listed as *Lycopodium mannii*)	E

Rare Plant Conservation and Endangered Species Law — an Annotated Bibliography

Benton K. Pang
Department of Botany, University of Hawai‘i

Rare plant conservation is perhaps one of the most important but least understood botanical fields in Hawai‘i. With 173 currently listed federally endangered plant species and 33 species proposed to be listed in the near future, Hawai‘i has the most endangered island species in the world. And while there is now a handful of books related to this topic for temperate areas, there are virtually none that discuss up-to-date solutions to environmental regulations with economic sustainability in Hawai‘i. I have written this annotated bibliography to help the conservation biologist, lawyer, and policy maker to understand each others' positions. I do not assume this list to be comprehensive nor the "best resources", but rather more to put in one place the literature sources by which those interested in the problems surrounding rare plant conservation can have a common pool of information and a starting point for a solution.

Reauthorization of the Endangered Species Act is due to come before Congress soon. Those business constituents who remember the northern spotted owl controversy, and the snail darter that almost stopped the Tennessee Valley Authority, will be out in force. Afterall, if those in the hospital and care facilities business can afford $100 million dollars lobbying against the health reform bill (benefiting about 20% of the American people who are not insured), what chances do a few plants and animals have who have only a few "bleeding heart biologists" speaking for them?

To be informed about plant species being endangered by the alteration of habitats, and the introduction of weedy species that tend to overwhelm native species and their environments, is simply not enough. Conservationists and surely the Hawaiian Botanical Society should be very pleased with the progress that has been made on the 170 endangered Hawaiian plant species that are now recognized by the Fish and Wildlife Service, but having them on the list does not guarantee their safety. We need to become more aware politically, and in predicting how to handle "hot potatoes" before they get "hot". Monitoring and enforcing the laws that are already on the books would help a great deal. But most of all, we need to become aware of all aspects so that we will be ready to confront those persons or agencies that would weaken the Act. It's important, its our future.

Books and Monographs

Barker, Rocky. *Saving All the Parts: Reconciling Economics and the Endangered Species Act.* Washington, D.C.: Island Press, 1993. 268 p.

Rocky Barker presents an overview of current endangered species controversies and a comprehensive look at the wide-ranging implications of human activities. He provides important background and summary information concerning the "jobs vs. the environment" issues that are in the news almost daily, and explains ideas and terms that are widely used but often little understood. The book analyzes trends in natural resource management, land use planning, and economic development that can lead to a future where economic activity can be sustained without the loss of essential natural values.

Bean, Michael J., *The Evolution of National Wildlife Law.* New York, New York: Praeger Publishers, 1983. 448 p.

Considered by some as "a landmark in the literature of American environmental law", *The Evolution of National Wildlife Law* discusses the major federal policies, regulations, and statutes pertaining to wildlife and includes in his discussion Indian treaty rights which sometimes regulates state and federal wildlife regulations.

Buck, Susan J. *Understanding Environmental Administration and Law.* Washington, D.C.: Island Press, 1991. 224 p.

Understanding Environmental Administration and Law is a primer on the real-life application of environmental law. It describes the public policy process through which the law is applied, and the statutory and case law that are critical to working within the regulatory system. A concise, authoritative guide, the book was designed specifically for people who need a thorough but rapid understanding of environmental law.

DeSilvestro, Roger L. *The Endangered Kingdom: The Struggle to Save America's Wildlife.* New York City, New York: John Wiley & Sons, 1989. 241 p.

The Endangered Kingdom: The Struggle to Save America's Wildlife explores the history of the dangerously close relationship between hunters and wildlife managers. A central and most valuable aspect of Roger DiSilvestro's book is his discussion of the role of hunters in conservation past and present. But DiSilvestro also discusses the hunters interest in concentrating on maintaining game rather than providing long-term viability of their own sport or for the well-being of nongame wildlife.

Elias, Thomas (ed.). *Conservation and Management of Rare and Endangered Plants*. Sacramento, California: California Native Plant Society, 1987. 630 p.

Conservation and Management of Rare and Endangered Plants is a collection of papers which came out of the proceedings of a California conference on the conservation and management of rare and endangered plants. The book is arranged by topics following the conference program starting with legal aspects of endangered plant conservation, California's endangered plants, California's endangered habitats, survey and assessment techniques, impacts of exotic species, case studies, ecology and population dynamics, monitoring and land use planning, species management, species recovery and restoration, current conservation activities, population size and preserve design, and educational awareness. The book, like the conference, reviewed the effects and seriousness of man's activities on rare and endangered plants and identified effective techniques for management and conservation of rare plants.

Falk, Donald A. and Kent E. Holsinger (eds.). *Genetics and Conservation of Rare Plants*. New York, New York: Oxford University Press, 1991. 283 p.

Genetics and Conservation of Rare Plants summarizes current knowledge of the genetics and population biology of rare plants, and offers practical recommendations for the design and implementation of conservation programs. The book features discussions on the distribution and significance of genetic variation, management and evaluation of rare plant germplasm, the genetic consequences of small population size, the application of neutral theory to the design of sampling schemes, and conservation strategies for genetic diversity. Case studies focusing on specific problems offer expert suggestions for today's management of rare plant diversity. Plant conservationists, ecologists, and evolutionary biologists will find this synthesis a key resource with which to meet the challenges of rare plant conservation.

Grumbine, R. Edward. *Ghost Bears: Exploring the Biodiversity Crisis.* Washington, D.C.: Island Press, 1992. 290 p.

Using the fate of the endangered grizzly bear-"the ghost bear"-to explore the causes and effects of species loss and habitat destruction, R. Edward Grumbine presents a clear and inviting introduction to the biodiversity crisis and to the science of conservation biology. He incorporates a wide range of perspectives from many different fields of inquiry from environmental law, history, policy, management, and ethics while still grounding his argument in the scientific fields of ecology and biology.

Kohm, Kathryn A (ed.). *Balancing on the Brink of Extinction: The Endangered Species Act and Lessons for the Future.* Washington, D.C.: Island Press, 1991. 316 p.

This book explores the Endangered Species Act with two questions: What have we learned about endangered species protection since the Act passed in 1973? And, based on our experiences, where would we direct future efforts? The twenty essays provide a comprehensive overview of the law's conception and history, and its potential for protecting the remaining endangered species.

Littell, Richard. *Endangered and Other Protected Species: Federal Law and Regulation.* Washington, D.C.: Island Press, 1992. 613 p.

Endangered and Other Protected Species analyzes the federal statutes, court and agency cases, and regulations that govern species protection. The book covers 19 federal statutes, the primary emphasis on the Endangered Species Act, the Lacey Act, the Marine Mammal Protection Act, the Bald and Golden Eagle Protection Act, and the Migratory Bird Treaty Act. In addition to presenting an analysis of the laws and regulations, Richard Littell reviews rulings that illustrate how the laws are applied to everyday transactions and projects.

Rohlf, Daniel J. *The Endangered Species Act: A Guide to its Protections and Implementation.* Stanford, California: Stanford Environmental Law Society, 1989. 207 p.

Used as a handbook by the Sierra Club Legal Defense Fund, *The Endangered Species Act: A Guide to its Protections and Implementation*, outlines the regulations of the Endangered Species Act particularly Section 4 (Listing and Critical Habitat designation), Section 9 (Takings and other statutory prohibitions), Section 7 (Mandates to conserve listed species and interagency consultations), and Section 8 (International aspects). By utilizing case law, and congressional hearings, Rohlf emphasizes the human need and national mandate to protect species diversity most of which have been human-induced.

Tobin, Richard. *The Expendable Future: U.S. Politics and the Protection of Biological Diversity.* Durham: Duke University Press, 1990. 325 p.

The Expendable Future provides a comprehensive and critical evaluation of the politics of biological diversity in the United States and of state and federal policies on endangered species from the early sixties to the present. Of particular interest is his discussion of endangered species policy and politics in Hawai'i using, as his example, the governmental relationship between the U.S. Fish and Wildlife Service and the State Department of Land and Natural Resources. Drawing on congressional hearings and debates, previously unpublished public opinion surveys, interviews with state officials and employees of the Department of the Interior, and internal documents from this and other government agencies, Richard Tobin provides an in-depth analysis of the policies on endangered species and the policy relationships among the different government units involved in their implementation. he examines the resources available for the protection of endangered species and the ways in which these resources are matched to priorities. Tobin also discusses the processes by which species are classified as endangered, how these species' critical habitat are determined and protected, and the successes and mostly failures, of current recovery programs.

Yaffee, Steven Lewis. *Prohibitive Policy: Implementing the Federal Endangered Species Act.* Cambridge, Massachusetts: MIT Press 1982. 239 p.

Prohibitive Policy: Implementing the Federal Endangered Species Act is written primarily for the social scientist interested in public policy. Steven Yaffee analyzes how institutions of government respond to and interpret prohibitive policy. He speculates about the causes and consequences of laws and regulations containing an explicit prohibition-"thou shalt not." Yaffee presents a clear history and description of the rationale behind legislative, executive, and judicial action on endangered species. In addition, he provides many insights into the tensions built into a process in which both technical expertise and political considerations play a major role.

Yaffee, Steven Lewis. *The Wisdom of the Spotted Owl: Policy Lessons for a New Century.* Washington, D.C.: Island Press, 1994. 430 p.

In *The Wisdom of the Spotted Owl: Policy Lessons for a New Century*, Steven Yaffee uses the case of the spotted owl as a framework for understanding the realities and idiosyncrasies of our public policy process. In addition to presenting a thorough history and analysis of the controversy, Yaffee outlines a set of reforms that will be invaluable to all those involved in the recreation of natural resource agencies and public policy processes as they face the challenges of the next century.

Organization Publications

Bean, Michael J., Sarah G. Fitzgerald, Michael A. O'Connell. *Reconciling Conflicts Under the Endangered Species Act: The Habitat Conservation Planning Experience*. Washington, D.C.: World Wildlife Fund, 1991. 109 p.

Reconciling Conflicts Under the Endangered Species Act: The Habitat Conservation Planning Experience discusses the implications of Section 10(a) of the Endangered Species Act allowing a private landowner to carry out "incidental take" of an endangered species in exchange for creating and implementing a plan that promotes the conservation of the species. Sometimes referred to as Habitat Conservation Plans (HCP's) some believe HCP's have not conserved species but rather lead to their detriment. The authors analyze the process under Section 10(a) and analyze case-by-case the past and present HCP's. They also offer a set of recommendations to assure that HCP's are an effective tool for reconciling development with conservation of endangered species.

Bergman, B.J. *Endangered Species and their Habitats-United States and Canada*. San Francisco, California: Sierra Club, 1992. 16 p.

A listing and description of each of the endangered species in the United States and Canada up to 1991.

King, Laura, Faith Campbell, David Edelson, Susan Miller. *Extinction in Paradise: Protecting our Hawaiian Species*. San Francisco, California: Natural Resources Defense Council, 1989. 95 p.

A proposal of recommendations by the Natural Resources Defense Council to increase the protection of endangered species and habitats in the state of Hawai'i focusing on intact native ecosystems that are home to large concentrations of endangered species. The authors describe "the extinction crisis in Hawai'i", summarize the state and federal regulations on protecting endangered species and current efforts, and list the fiscal appropriations to the state and federal government which have, many times, governed the lack of protection for these species.

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A Survey for the Endangered ‘Akoko (*Chamaesyce skotsbergii* var. *skottsbergii*) at Barbers Point Naval Air Station, Kalaeloa, O‘ahu

Benton Keali‘i Pang*[1]*, Janet Connor, Anne Hoevels, Lauren Kuhn

[1] University of Hawai‘i, Department of Botany, 3190 Maile Way #101, Honolulu, HI 96822.

Introduction

Chamaesyce skottsbergii var. *skottsbergii*, also known as ‘akoko, was officially listed as an endangered plant on August 24, 1982, and rules pertaining to its protection were implemented on September 23, 1982 (47 FR 36846). At that time the plant was named *Euphorbia skottsbergii* Sherff var. *kalaeloana* Sherff. The current taxonomy by Wagner Herbst and Sohmer (1990) combines *Euphorbia multiformis* var. *kapuleiensis* f. *pekelonis*, *E. skottsbergii* var. *audens* and *E. s.* var. *kalaeloana* into one species and variety. No critical habitat has currently been proposed, as its current areas are considered

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so altered by human contact that they are no longer essential to the survival of the species (47 FR 36846).

Chamaesyce, a genus of the Euphorbiaceae, is a perennial subshrub that can measure up to 2 meters with slender, and usually jointed branches (USFWS 1993). Leaves are normally less than 2 cm long, and in the *kalaeloana* variety they are ovate or obovate, with a hairless upper surface and serrated margins when young (Wagner Herbst and Sohmer, 1990). The leaf color can vary from pale gray-green to a bright light green. Cyathia are borne about 1.5 mm from the leaf axils and the green capsules are about 2 mm long.

This shrub is currently found on the ‘Ewa Plain, in particular Barbers Point Naval Air Station on Kalaeloa, on the island of O‘ahu and on the northwest end of Moloka‘i (USFWS 1993). Substrate types consist of limestone areas with sinkholes and coralline rubble in coastal areas and dry shrublands (USFWS, 1993). Soil tends to be very thin with pockets of humus, and although the areas suffer from prolonged summer drought, the water table is very high (USFWS, 1993).

When the plant was listed as an endangered species, the only agencies opposing the listing of ‘akoko were the Smithsonian Institution and the Governor of Hawai‘i (47 FR 36846). Governor Aryoshi stated that the listing would impose restrictions on current plans for a deep draft harbor on the ‘Ewa Plain in areas where the plant was situated (47 FR 36846). He also mentioned that he, the Army Corps of Engineers, and a private company, were adequately preserving the plant by means of translocation. The USFWS did its own study and determined that the plant's listing would not be harmful to the plans for the deep draft harbor (47 FR 36847).

Population status

According to the U.S. Fish and Wildlife Service (FWS) draft recovery plan *Chamaesyce skottsbergii* var. *skottsbergii* plants on O‘ahu are primarily existing near the Barber's Point Naval Air Station (USFWS 1993). Of the eight subpopulations statewide noted by FWS, three are on the

Naval Air Station itself. Subpopulation 4 is located just west from the Air Station. Subpopulation 1 consists of approximately 5,000 plants, which is the same number as of 1983. In 1984, subpopulation 2 consisted of approximately 20 plants, however, in the survey of 1993 the USFWS found only one plant. Subpopulation 3 (less than 200 plants) was transplanted from two other subpopulations. Due to construction of the Barber's Point deep draft harbor, both subpopulations are virtually eliminated. Subpopulation 4 has held a stable number of 30 plants since 1980. Subpopulation 5,6,7, and 8 are located on the island of Moloka'i. In short, they estimated at least 30,000 plants in Subpopulation 5, at least 3,000 plants are extant in Subpopulation 6, and 200+ plants occurring in Subpopulation 7. The number of plants in Subpopulation 8 is unknown.

A survey in 1989 by some University of Hawai'i students found that an area proposed for a deep draft harbor off Malakole Blvd. had no plants due to construction activities (Ellshoff, Gabriele and Kamehiro, 1989). This same area had at least 40 individuals in 1984 according to

Subpopulations of *Chamaesyce skottsbergii* var. *skottsbergii* (USFWS 1993)

Subpopulation No.	Location	No. of Individuals
'Ewa Plains, O'ahu		
1	Barbers Point NAS	5,000
2	Barbers Point NAS	1
3	Barbers Point NAS	<200
4	West of Barbers Point NAS	30
Moloka'i		
5	Na'aukāhihi	30,000
6	Mo'omomi	3,000
7	Mo'omomi	200
8	Pāpohaku	?

the Hawai'i Heritage Program. Another area of their survey found no survivors after translocation experiments from the deep draft harbor area to the Hawai'i Raceway Park (Ellshoff, Gabriele and Kanehiro, 1989).

Methods

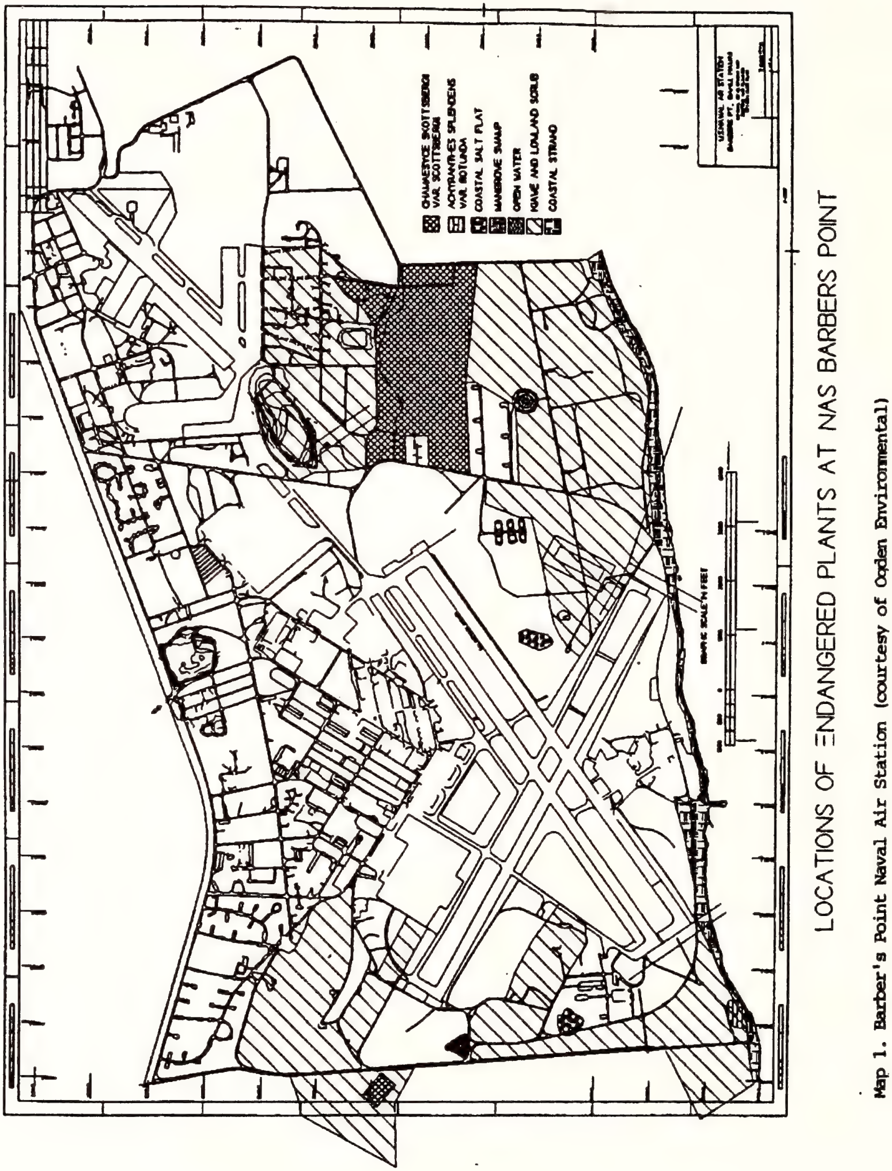
A field team of four university students visited Barbers Point NAS on November 6 and 26 of 1993 to identify populations of the endangered 'akoko and to establish a permanent plot for future and long-term studies.

The population chosen for study was just south of Takanis Bay near some empty weapons bunkers (see map 2). This area was one of the largest populations of 'akoko noted in the AECOS (1981) report (identified as population #15 of at least 5000 individuals) and is restricted from public access. Faded signs marked "Keep Out Endangered Plant Species" are posted along Coral Sea Road south of Takanis Bay.

The vegetation of the study area is an open scrub surrounded with kiawe (*Prosopsis pallid*a) trees. The dominating shrubs are the koa haole (*Leucaena leucocephala*) and klu (*Acacia farnesiana*). Klu is a yellow blooming shrub often occurring next to the endangered 'akoko. In addition, bufflegrass (*Cenchrus ciliarus*) covers most of the ground in the study area. Native plants occurring in the area of the endangered 'akoko are 'ilima (*Sida fallax*), 'uhaloa (*Waltheria indica*) and kauna'oa pehu (*Cassytha filiformis*). The parasitic kauna'oa pehu vine hides nearby trees and shrubs.

Approximately 400 meters from the road into the study area a plant was identified adjacent to the hiking trail. (This would later be sited as a small group plants marked cluster A). The four field members randomly dispersed from this area and located additional groups of individuals. Four large groups were flagged and number of mature and immature individuals were recorded.

The field team returned on November 26, 1993 to set up a permanent study plot. The plot was marked with four 1 m tall reebar stakes and florescent orange flagging tape marking each corner. A quadrant 35 m in length by 45 m in width (1575 m^2) was made. A compass was used to estimate direction of


CHAMAESYCE SKOTTSBERGII VAR. SKOTTSBERGII
ACHYRANTHES SPLENDENS VAR. ROTUNDA
COASTAL SALT FLAT
MANGROVE SWAMP
OPEN WATER
KIAWE AND LOWLAND SCRUB
COASTAL STRAND
GRAPHIC SCALE IN FEET
LOCATIONS OF ENDANGERED PLANTS AT NAS BARBERS POINT
Map 1. Barber's Point Naval Air Station (courtesy of Ogden Environmental)

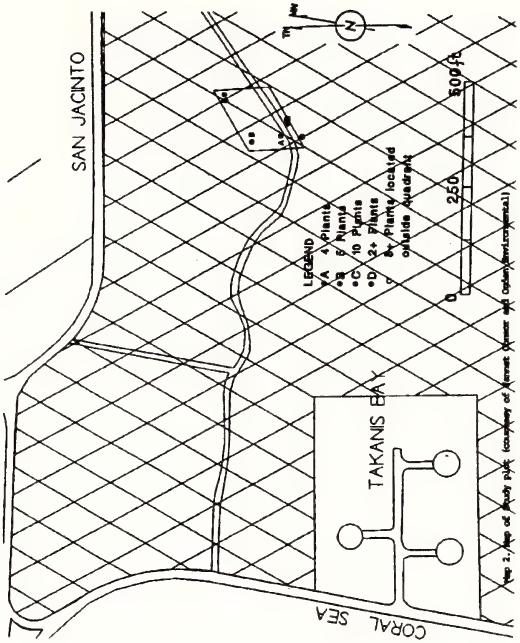
Map 1. Barbers Point Naval Air Station (Courtesy of Odgen Environmental) each of the sides. An AutoCAD map was generated by Ogden Environmental Sevices using field notes of the study area (See maps 1 and 2).

After the survey and a review of the literature, management reccomendations were made to ensure the long-term survival of the species.

Results

A total of 29 plants of *Chamaesyce* were surveyed in the study area. In the 1575 m^2 permanent plot we found 21 plants, the additional 8 plants were found outside the study plot. Three of the 21 plants are seedlings less than 0.5 m, and the remaining individuals are mature plants measuring to a height of approximately 2 m. As map 2 illustrates, cluster A consists of 4 mature plants, cluster B consists of five plants, cluster C consists of 10 plants including the three seedlings, and, cluster D consists of 2 + plants. The remaining 8 plants outside our plot are next to cluster D.

In our first site visit, all mature plants were blooming and at least three insect taxa were pollinating these individuals. Three weeks later, none of the mature plants had flowers.



Map 2. Map of study plot (Courtesy of Odgen Environmental)

Management Recommendations

1. Resurvey populations at Barber's Point NAS and fence populations as sanctuaries from human disturbance

Justification:

☐ Our small survey along with surveys by botanical consultants (see Whistler 1993) are the latest in estimating population sizes and plant vigor. A thorough survey of Barber's Point NAS by the FWS for the endangered ‘akoko and other federally listed species is needed before the base is decommissioned.

☐ Current dirt trails are easily accessible by humans and two larger dirt roads for vehicles are in close proximity to our study plot.

☐ Since the AECOS (1981) report there has been many changes at Barbers Point NAS including the transplantation of individuals and the construction of buildings in areas of ‘akoko (Whistler, 1993). Fences with educational signs around all the populations and notifying proper administrators of the endangered ‘akoko can prevent its extinction.

2. Place clear weather-proof identification signs around all ‘akoko populations on O‘ahu.

Justification:

☐ Many of the signs have weathered due to the extreme weather conditions. Constructing weatherproof signs with an educational component notifying the public on the importance of ‘akoko may help to insure its protection.

3. List critical habitat for the species.

Justification:

☐ Like most of the endangered Hawaiian plants, *C. skottsbergii* var. *skottsbergii* has no listed critical habitat. It is essential to list critical habitat before 1997 and any State plans for development and other adverse economic impacts to insure the survival of intact natural populations.

4. Control alien insect predators of ‘akoko.

Justification:

☐ USFWS (1993) mentions some alien insect predators to ‘akoko. Biological control can be considered only if it is species specific, and realizing control of an insect predator can have adverse effects on insect pollinators important for reproduction of ‘akoko.

5. Control alien weed species and the native vine, *Cassytha filiformis* at Barbers Point.

Justification:

☐ Special care should be taken for buffle grass because it is a potential fire hazard. Round-up (glycophosphate) has been proven for control of similar alien grasses.

☐ Alien grasses and weeds prevent seedling germination of ‘akoko.

☐ Though a native plant *Cassytha filiformis* poses a threat to the ‘akoko populations through shading. Spread of this vine should be closely monitored and managed.

6. Increase population sizes through plant propagation techniques and outplanting in the same areas where material was collected.

Justification:

☐ Plant propagation techniques can follow results from the AECOS (1981) report and tissue culture experiments. The genetic integrity of all subpopulations of plants on O‘ahu and between O‘ahu and Moloka‘i should be maintained until research into genetics on ‘akoko find that mixing of genes from these subpopulations prove otherwise.

7. Monitor alien mammals and rodents on their predatory effects on ‘akoko at O‘ahu and Moloka‘i populations.

8. Continue monitoring of permanent plot at Barber’s Point and compare population fluctuations year by year.

Justification:

☐ Encourage university students (eg. Science 490) to monitor the permanent plot annually.

9. Secure the ‘akoko populations and native dryland species for long-term survival as an example of a lowland leeward forest.

Justification:

☐ The Defense Base Closure and Realignment Act of 1990, leaves the Barber’s Point area under federal jurisdiction until 1997. At that time the State will take over and may plan for housing developments in the area.

☐ Many native dryland species occur on Barbers Point and would be a suitable example of a lowland dryland forest.

☐ The presence of another endangered species *Achyranthes splendens* var. *rotundata* and the culturally important sink holes could justify the long-term management of Barber's Point as an endangered species plant sanctuary by the federal government or State NARS.

☐ Management of alien species, studies in reproductive biology and genetics are critical for the survival of the endangered ‘akoko and can be an example for future management of other endangered Hawaiian species.

☐ The dryland forests are the most critically endangered ecosystem in Hawai‘i .

Discussion

AECOS (1981) reported that the endangered ‘akoko loses its leaves during the summer months and regains them after the winter rains. Though individuals looked healthy on our first visit in November, two weeks later, leaves were starting to senesce even though the winter rains were just beginning. Many alien species including kiawe, koa haole and bufflegrass may pose a serious threat to the survival and regeneration of the species. Koa haole grows in dense thickets preventing seedling growth of ‘akoko and bufflegrass is an extreme fire hazard. Kauna‘oa pehu, a parasitic vine that shades out understory plants, is a unique threat because it is an indigenous plant.

The FWS and the State of Hawai‘i actively seek to secure the longevity of this and other populations of ‘akoko at Barbers Point. Besides faded and unreadable signs and occasional security checks by the military police, the population of ‘akoko in the study area was not fenced and even had a foot path going through the middle third of our study plot. The federal government under congressional order is currently decommissioning Barbers Point NAS and will sell back the parcel to the State of Hawai‘i by 1997. Setting aside nature preserves now under the State Natural Area Reserve System or Federal Wildlife Refuges is critical for the long-term management of these and other natural populations of endangered species at Kalaeloa.

Acknowledgments

The authors would like to thank the installation commander at Barbers Point Naval Air Station, Lieutenant commander E.A.

Clarkson for granting permission to survey on base, Marie Brugemann and the U.S. Fish and Wildlife Service Pacific Islands Office for a draft recovery plan of the endangered *Chamaesyce*, and Ogden Environmental for providing the maps. Lastly, we would like to thank Dr. Sheila Conant who gave us the idea to survey this endangered species and whose inspiration can help protect the endangered ‘akoko for future generations.

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Call for Articles

Now's the time to submit articles to the newsletter. Scientific articles, casual observations, news items, commentaries are all welcome. Send your papers to: Editor, Hawaiian Botanical Society, c/o Department of Botany, University of Hawai‘i at Mānoa, 3190 Maile Way, Honolulu, HI 96822. Or send e-mail to koob@uhunix.uhcc.hawaii.edu.

New Administrative Rules for Hawaii's Threatened and Endangered Plants

At the October meeting of the Hawaiian Botanical Society, Michael Buck of the Division of Forestry and Wildlife presented proposed changes to the administrative rules on how the State deals with threatened and endangered species.

Mr. Buck explained that the following document is only a draft. There will be public hearings on the proposed rule changes and all Society members are encouraged to attend the hearings and make comments.

The general gist of the rule changes is the creation of three levels of permits or licenses for possession of threatened and endangered plants. At the first level (Class A) are botanical gardens and arboreta who are allowed to collect and posses the plants for scientific, propagation, and outplanting purposes. The next level (Class B) allows institutions to possess the plants for educational purposes. The final level would include everybody else (Class C) who would possess the plants for horticultural purposes. Plants and licences at the Class B and C levels would be obtained from Class A license holders.

The rule changes are an attempt to make it possible for more people to legally handle threatened and endangered plant species. It will still be illegal to sell these species but Class A licensees can give them away and issue permits to those who receive them. Provisions are still in the rules to keep endangered species on their original islands to prevent genetic mixing of populations.

Please read the following draft of the proposed rule changes carefully. If you have opinions on any or all of them there will be public hearings into the matter. Watch the papers for dates and times for your island. The hearings should start in November, 1994.

The following draft was taken from a handout given at the October meeting of the Hawaiian Botanical Society. To save space the appendix listing the endangered species was not included.

DEPARTMENT OF LAND AND NATURAL RESOURCES

Adoption of Chapter 13-107
Hawaii Administrative Rules

1. Chapter 107 of Title 13, Hawaii Administrative Rules, entitled "Threatened and Endangered Plants" is adopted to read as follows:

DRAFT 9/10/94

"HAWAII ADMINISTRATIVE RULES
TITLE 13
DEPARTMENT OF LAND AND NATURAL RESOURCES
SUBTITLE 5 FORESTRY AND WILDLIFE
PART 1 FORESTRY
CHAPTER 107
THREATENED AND ENDANGERED PLANTS

§13-107-1 Purpose
§13-107-2 Definitions
§13-107-3 Prohibited activities
§13-107-4 Class A license for scientific, propagation, and outplanting use
§13-107-5 Class B license for educational use
§13-107-6 Class C license for horticultural use
§13-107-7 Designation of horticultural-use species
§13-107-8 Transporting licenses
§13-107-9 Compliance with laws
§13-107-10 Penalty
§13-107-11 Exemption

Historical Note: Chapter 13-107, Hawaii Administrative Rules, is based substantially upon Chapter 13-124, Hawaii Administrative Rules of the Division of Forestry and Wildlife, Department of Land and Natural Resources. [Eff.]

§13-107-1 Purpose. The purpose of this chapter is to preserve, manage and protect endangered and threatened plants. [Eff.] (Auth: HRS §§195D-3, 195D-4, 196D-6) (Imp: §§195D-3, 195D-4, 196D-6, 50 CFR §§17.12)

§13-107-2 Definitions. As used in this chapter unless the context requires otherwise:

“Accidental or non-negligent death” means death of plants which occurs despite the best possible care of the plant possessor.

“Authorized representative” means the administrator, foresters, botanists, conservation enforcement officers, and other persons within the department of land and natural resources, division of forestry and wildlife authorized by the board of land and natural resources to act for the board.

“Board” means the board of land and natural resources.

“Certificate of pre-listing possession” means a certificate issued by the department of land and natural resources, division of forestry and wildlife, to persons who possessed cultivated plants, plant parts, or both, of a threatened or endangered species at least one year prior to their listing, verifying that the plant material was obtained prior to listing.

“Class A license” means a license issued by the department of land and natural resources, division of forestry and wildlife, to collect, possess, take, transport, propagate or outplant plants, plantparts, or both, from wild populations of a threatened or endangered species for research or propagation purposes or both, to enhance survival of the species.

“Class B license” means a license issued by the department of land and natural resources, division of forestry and wildlife, to possess and transport within a single island plants, plant parts, or both, of a threatened or endangered species which are derived from garden-grown stocks (not from wild populations or plants) for educational use.

“Class C license” means a license issued by the department of land and natural resources, division of forestry and wildlife, or a Class A, Class B or Class C licensee, to possess, propagate, or transport, or all three, within a single island horticultural-use plants, plant parts, or both, of an approved threatened or endangered species in captivity in a manner consistent with the preservation, protection, and conservation of native species. These plants must be the offspring of garden-grown stock, not from wild populations or plants.

"Controlled environment" means a habitat, such as a nursery, arboretum, or garden, which is manipulated by man for the purpose of growing and producing offspring of select species, and has boundaries designed to prevent selected species from entering or leaving the habitat. General characteristics may include but are not limited to artificial housing, health care, protection from predators, and artificially supplied food and water.

"Cultivated plants" means propagules or plants germinated and grown within a controlled environment. No plants growing in the wild, including experimental populations, will be considered cultivated plants.

"Department" means the department of land and natural resources.

"Educational use" means use of plants or plant parts for display purposes to aid in education about that plant.

"Endangered species" means all species, subspecies, or sub-populations of plants that have been officially listed by the federal government, state government, or both, as endangered and any species, subspecies, or sub-population of native plants listed in the exhibit entitled "Chapter 13-107, Exhibit 1, 9/1/94", which is located at the end of this chapter and incorporated by reference. (*this section has not been included to save space - ed.)*

"Experimental populations" means any populations resulting from plantings outside a controlled environment (including offspring arising solely therefrom); not naturally occurring populations.

"Horticultural use" means use of cultivated plants or plant parts propagated from garden-grown stocks of an endangered or threatened species which have been approved by the department for that purpose.

"Horticultural-use plants" means cultivated plants or plant parts propagated from garden-grown stocks (not wild-collected), belonging to a threatened or endangered species which have been approved by the department for private possession.

"Horticultural-use species" means a threatened or endangered species which has been approved by the department for propagation for horticultural use.

"License" means written permission by the department of land and natural resources to do a particular act or series of acts which without such permission would be unauthorized or prohibited.

"Native" means endemic and indigenous species which arrived and occur naturally in Hawaii without the aid of humans.

"Outplanting" means those threatened and endangered plants (and their offspring) planted and growing outside a controlled environment as a result of human intervention which are sanctionedor licensed plantings by the department.

"Person" means an individual or a named representative of a corporation, partnership, trust, association, or any private entity, or any officer, employee, agent, department, or instrumentality of the federal government, or any state or political subdivision thereof, or of any foreign government.

"Plant" means any member of the plant kingdom, including seeds, roots, and other parts thereof.

"Pre-listed plants" means cultivated plants or plant parts in an individual's possession at least one year before that species became listed by the federal government, state government, or both, as threatened or endangered.

"Propagule" means a living plant part such as a cutting or a seed that reproduces a plant.

"Species" means and shall include any subspecies or lower taxa of plant(s).

"Take" means to cut, collect, uproot, destroy, injure, or possess native endangered or threatened species of plants, or to attempt to engage in any such conduct.

"Threatened species" means all species, subspecies, or sub-populations of plants that have been officially listed by the federal government, state government, or both, as threatened and any species, subspecies, or sub-population of plants listed in the exhibit entitled "Chapter 13-107, Exhibit 2, 9/1/94", which is located at the end of this chapter and incorporated by reference.

"Wild populations" means naturally occurring populations that do not occur as a result of planting or reintroduction into the wild. [Eff.] (Auth: HRS §§195D-3, 195D-4, 196D-6) (Imp: §§195D-3, 195D-4, 196D-6, 50 CFR §§17.12)

§13-107-3 Prohibited activities. (a) No person shall attempt to take, as defined by section 195D-2, Hawaii Revised Statutes, possess, process, injure, kill, destroy, disturb, sell, or offer for sale, transport, or export, any native threatened or endangered plant or parts thereof from any lands within the State of Hawaii, except as an authorized representative of the department or without first obtaining all required federal and state permits or licenses and except as provided in this chapter. No actions affecting threatened or endangered species will be allowed by anyone, including licensees and authorized representatives, except for scientific purposes or to enhance the propagation or survival of the species.

(b) No person shall plant into the wild any threatened or endangered species without a Class A license from the department and prior approval by the landowner.

(c) No person shall plant into the wild any threatened or endangered species that is diseased, of questionable genetic origin, or that may hybridize with related species in the vicinity.

(d) Horticultural propagation cannot be used to either justify or mitigate the transplantation, removal, or destruction of wild threatened plants, wild endangered plants, or populations of either or both. [Eff.] (Auth: HRS §§195D-3, 195D-4, 196D-6) (Imp: §§195D-3, 195D-4, 196D-6, 50 CFR §§17.12)

§13-107-4 Class A license for scientific, propagation, and outplanting use.
(a) Licenses for collecting, possessing, taking, transporting, propagating, and outplanting threatened or endangered species of plants or plant parts from wild populations may be issued by the board or its authorized representative only to authorized collectors of a recognized museum, approved botanical garden, or arboretum with experience in growing threatened and endangered plants, a scientific research organization, or to persons who are engaged in scientific research or programs of propagation, outplanting, or recovery which have been approved by the federal government, the department, or both, for which collection is essential.

(b) Licenses to take as defined by section 195D-2, Hawaii Revised Statutes, possess, process,transport, or export any endangered or threatened species of plant may be issued only for scientific or propagation purposes to enhance the survival of the species.

(c) Applications for licenses shall be in writing and contain:

(1) A description of the scientific, propagation or outplanting project, including its purpose, methods, study plan, and length of duration;

(2) Specific information as to species to be collected, the number of specimens, what plants or plant parts are to be collected, the collecting locations, and the dates of collection;

(3) The affiliation of the collector(s) or organization sponsoring the project; and

(4) Disposition of collected living plants upon expiration of license.

(d) Applications for licenses to take, as defined by section 195D-2, Hawaii Revised Statutes, any endangered or threatened species of plant shall, in addition, include a discussion of the value of the research, propagation, or outplanting relative to the survival of the species, where and how specimens will be stored, grown or outplanted, and how these activities will affect the wild population(s).

(e) No license may be amended or otherwise altered without the written approval of the board or its authorized representative.

(f) An annual summary of plants collected shall be submitted to the department by the license holder by July l of each year for the duration of the license period and shall include:

(1) The name and address of the licensee(s);

(2) The scientific and common names of the plants;

(3) The dates collection occurred;

(4) The number of specimens collected;

(5) The location(s) of the collection(s);

(6) Results of research or propagation; and

(7) Any other information required on the license.

(g) A biennial report of outplanted plants shall be submitted to the department by the license holder by July 1 of every other year for the duration of the license period and shall include:

(1) The name, address, and affiliation of the person to whom the license was issued;

(2) The species of plant(s);

(3) The number of live plants or plant parts per species and number that have died while in licensee's possession, date license was issued, date plants were outplanted, plant location, locality of collection of original wild plant material, agency or person donating plants, average size of plants when outplanted; and

(4) The present size and condition of the plants.

(h) A license including permission to transport plants or plant parts between islands is valid only when the necessary Hawaii department of agriculture inspections and permits are approved.

(i) Class A license holders may transfer plant propagules of horticultural-use plants to an individual(s) by issuing a Class C license to that individual.

(j) Accidental death of plants obtained under a Class A license will not be subject to penalty under this chapter, provided the holder of the Class A license has exercised due care in the performance of actions authorized by the license. [Eff.] (Auth: HRS §§195D-3. 195D-4, 196D-6) (Imp: §§195D-3, 195D-4, 195D-5, 196D-6, 50 CFR §§17.12)

§13-107-5 Class B license for educational use.

(a) Licenses for possessing and transporting within a given island cultivated individuals of a threatened or endangered species derived from garden-grown stocks (i.e. the offspring of plantscollected from the wild) or educational purposes may be issued by the board or its authorized representative.

(b) Applications shall include a discussion of the nature and educational value of such possession, transportation, or both.

(c) Plants will not be sold or kept for profit.

(d) License holders shall:

(l) Maintain and submit to the department records on the origin of their plant material, certifying that the plant material is not wild collected.

(2) When giving away plants or plant parts for horticultural use, provide certification in the form of a Class C license to recipients of the plant materials.

(3) Grow plants and propagules in vicinities where there are no related wild species.

(4) Not transport plants or plant parts to other islands without prior approval from the department.

(e) Licenses shall not be issued when:

(1) The introduction of a species to a new locality is not in the public interest; and

2) The introduction of a species to a new locality would be detrimental to native species.

(f) No license may be amended or otherwise altered without the written approval of the board or its authorized representative.

(g) A biennial summary report shall be submitted to the department by July 1 of every other year. The report shall include:

(1) The name and address of the person or agency to whom the license was issued;

(2) The species of plant (s);

(3) The number of live plants or plant parts and number that have died while in licensee's possession, date license was issued, plant location, locality of collection of original wild plant material, agency or person donating plants; and

(4) The condition of the plants.

(5) A summary of any Class C licenses given, including names and addresses of recipients.

(6) A description of how the educational use of the plant(s) has benefitted the public.

(h) Accidental death of plants obtained under a Class B license will not be subject to penalty under this chapter. [Eff.] (Auth: HRS §§195D-3, 195D-4, 196D-6) (Imp: §§195D-3, 195D-4, 195D-5, 196D-6, 50 CFR §§17.12)

§13-107-6 Class C license for horticultural use.

(a) Licenses for possessing and transporting within a given island approved horticultural-use plants derived from garden-grown stocks (i.e. the offspring of plants collected from the wild) may be issued by the board, its authorized representative, by Class A or Class B license holders, or by transfer from another Class C license holder to individuals who agree in writing to propagate threatened or endangered plants in captivity in a manner consistent with the preservation, protection, and conservation of native species under the conditions stated in the license.

(b) Plants will not be sold or kept for profit.

(c) License holders shall:

(1) Maintain and submit to the department records on the origin of their plant material, certifying that the plant material is not wild collected.

(2) When giving away plants or plant parts for horticultural use, provide certification in the form of a Class C license transfer to recipients of the plant materials.

(3) Grow plants and propagules in vicinities where there are no related wild species.

(4) Not transport plants or plant parts to other islands without prior approval from the department.

(5) Send the division a copy of the Class C license when it is issued by someone other than the division of forestry and wildlife.

(d) Licenses shall not be issued when:

(l) The introduction of a species to a new locality is not in the public interest; and

(2) The introduction of a species to a new locality would be detrimental to native species.

(e) No license may be amended or otherwise altered without the written approval of the board or its authorized representative.

(f) Death of plants obtained under a Class C license will not be subject to penalty under this chapter.

(g) Procedure for transferring horticultural-use plants: Horticultural-use plants or plant parts, or plants or plant parts derived from horticultural-use plants may be given to other individuals under the conditions stated in the Class C license. A Class C license transfer must be signed by both parties (the original and new owner). The original Class C license transfer must be kept with the new plant owner, one copy mailed to the division of forestry and wildlife by the new licensee within five working days of receipt of plant(s), and one copy kept by the original owner. [Eff.] (Auth: HRS §§195D-3. 195D-4, 196D-6) (Imp: §§195D-3, 195D-4, 195D-5, 196D-6, 50 CFR §§17.12)

(h) This Class C licensing must be conducive to chapter 195D, HRS, and encourage educational opportunities, while minimizing risks to wild populations.

§13-107-7 Designation of horticultural-use species.

(a) Petitions for the classification of horticultural-use species will be sent to the department.

(b) The petition will be referred to a committee composed of a minimum of five members who are knowledgeable of the biological conditions required to grow native plants and are not involved in commerce of plants. The committee shall evaluate, based upon research tests, whether classification of a species to horticultural use will endanger wild populations of that or any other native species, and will make recommendations to the department, which will approve or deny these petitions.

(c) The petitioner will be responsible for obtaining the biological information needed by the committee to make a recommendation as to the status of a species.

(d) The committee will review horticultural-use species at a minimum of once per year and recommend continuing or denying species for horticultural use based upon chapter 195D, HRS, wild plant protection, and enforcement criteria. [Eff.] (Auth: HRS §§195D-3, 195D-4, 196D-6) (Imp: §§195D-3, 195D-4, 195D-5, 196D-6, 50 CFR §§17.12)

§13-107-8 Transporting licenses.

(a) Licenses may be issued by the board or its authorized representative to persons who apply in writing to transport threatened or endangered plants, or both, to other islands within the state when such transport is not covered under an existing license.

(b) Licenses shall not be issued when:

(1) The introduction of a species to a new locality is not in the public interest; and

(2) The introduction of a species to a new locality would be detrimental to native species.

(c) No license may be amended or otherwise altered without the written approval of the board or its authorized representative.

(d) This license is valid only when the necessary Hawaii department of agriculture inspectionsand permits are approved.

(e) Out-of-state transportation must meet all federal requirements and permit procedures.

(f) A summary report shall be submitted to the department upon the expiration of the license. The report shall include:

(1) The species of plant(s),

(2) The number of plants, date, locality of collection of wild material, or agency or person donating plants;

(3) Plant destination; and

(4) Reason for transporting plants.

(g) Accidental death of plants being transported under authority of a transporting license will not be subject to penalty under this chapter, provided the license holder has exercised due care in assuring the well-being of the plants. [Eff.] (Auth: HRS §§195D-3, 195D-4, 196D-6) (Imp: §§195D-3, 195D-4, 196D-6, 50 CFR §§17.12)

§13-107-9 Compliance with laws. All persons applying for licenses as per this chapter shall comply with all federal, state, and county laws, rules, and required permits or licenses. [Eff.] (Auth: HRS §§195D-3, 195D-4, 196D-6) (Imp: §§195D-8, 195D-9)

§13-107-10 Penalty. Any person violating any part of this chapter shall be penalized as provided by law. [Eff.] (Auth: HRS §§195D-3, 195D-4, 196D-6) (Imp: §§195D-8, 195D-9)

§13-107-11 Exemption.

(a) Persons who possessed cultivated plants or cultivated plant parts over one year prior to their listing as threatened or endangered shall apply for a certificate of pre-listing possession from the division of forestry and wildlife, verifying the legitimate nature of such possession. These cultivated plants must have been grown in a controlled environment provided that the purposes of the holding were not contrary to the purposes of chapter 195D, HRS, and that the plants were not held for sale or resale. Wild plants and populations cannot be given pre-listing status under any circumstances. To apply for a certificate of pre-listing possession the person shall submit the following documentation o the division of forestry and wildlife within three months of the plant's listing or the effective date of these rules:

(1) The species' scientific name;

(2) The location and number of plants, plant parts, or both, to be given pre-listing status;

(3) When and where the plants, plant parts, or both, were obtained.

(b) Accidental death of plants certified as prelisted plants in cultivation will not be subject to penalty under this chapter.

(c) Given that the listing process gives advance notice of at least one year before a species is listed as threatened or endangered, persons who possessed cultivated plants or cultivated plant parts less than one year prior to their listing as threatened or endangered will be required to apply to the division of forestry and wildlife for a Class B or Class C license following the procedures outlined in this chapter. [Eff.   ] (Auth: HRS §§195D-3, 195D-4, 196D-6) (Imp: §§195D-3, 195D-4, 195D-6)

2. The adoption of Chapter 13-107, Hawaii Administrative Rules, shall take effect ten days after filing with the Office of the Lieutenant Governor.

I certify that the foregoing are copies of the rules drafted in the Ramseyer format, pursuant to the requirements of section 91-4.1, Hawaii Revised Statutes, which were adopted on   , and filed with the Office of the Lieutenant Governor.

Chairperson, Department of Land and Natural Resources

APPROVED AS TO FORM:

Deputy Attorney General

BOSTOC Minutes for April 4, 1994

President Keeley called the April meeting to order at 7:35 p.m.

Minutes of the March meeting were read, and accepted

Treasurer's report was read and accepted

President Keeley added that the books are in order after the audit. In addition she made a call for members to increase membership by soliciting new members into the Society

The membership committee proposed no new members

Don Gowing again requested the Society to increase its membership because much of the current funds in savings are from life memberships and therefore are in escrow

Unfinished business

Plant Sale in May

The letter requested by Patrick Conant urging the State of Hawai'i to survey for *Miconia* populations was sent to the Dept. of Forestry and Wildlife.

President Keeley introduced the plant of the month speaker, Dr. Dan Palmer. He mentioned his talk should be more appropriately be called "the disease of the month" or "the insect of the month." Dr. Palmer spoke on the distribution and effects of the two-spotted leaf hopper on the native forests especially in the M-anoa Valley area. He showed pictures of `uluhe die back and the replacement of these areas with alien grasses and weeds as older plants die off. He was most concerned with the hapu`u infestations but other native ferns and, even native trees and shrubs are affected by this recently introduced insect. Biologists have not had conclusive results of the mechanism leading to the die back but give three possibilities: 1) insect saliva, 2) the insect is a vector for a virus, or 3) it is a mycoplasmic infection. Currently, there is no biocontrol for this insect and studies on its biology are problematic given its unusual life history.

President Keeley introduced Sam Gon III of the Hawai‘i Heritage Program at the Nature Conservancy of Hawai‘i. Dr. Gon spoke on the recent botanical findings by the Heritage Program on O‘ahu's military lands. After a brief history of the Legacy program and the Nature Conservancy's involvement with biological surveys on Hawai‘i's military installations he highlighted the rare plant taxa found at Makua Valley, Schoefield, Lualualei, the Kawailoa Training Area, and the Kahuku Training Area. He showed pictures of rare plants and their habitats. Some of these taxa have been rediscovered and previously thought to be extinct, while others are new records of distribution for the species. The survey results which are currently being completed by the Heritage Program for the military provide new insights into the distribution of rare plant taxa in a variety of native ecological habitats and will include management recommendations for these rare species and their habitats.

NEWSLETTER OF THE HAWAIIAN BOTANICAL SOCIETY
C/O DEPARTMENT OF BOTANY
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Newsletter of the
Hawaiian Botanical Society
Volume 33 Number 4 *December, 1994*

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A Hawaiian Bog in the Ko'olau Mountains of O'ahu?

Evidence from Community Structure and Diagnostic Species

SMITHSONIAN
JAN 27 1995
LIBRARIES

by Samuel M. Gon III
Ecologist, Hawai'i Natural Heritage Program
The Nature Conservancy of Hawai'i

Bogs dominated by 'ōhi'a (*Metrosideros polymorpha* and/or other bog-typical *Metrosideros* spp.) and a variable set of codominant and constituent shrubs, sedges, and grasses had until recently been documented only on Kaua'i, Maui, Moloka'i, and Hawai'i at elevations ranging from 860 to 1,830 meters (2,800 to 6,000 feet) (Figure 1). These 'Ōhi'a Montane Bogs constitute a natural community considered both fragile and globally imperilled (Heritage global rank: Gl; HINHP 1994a) This paper briefly characterizes this distinctive Hawaiian vegetation type, discusses a previous report of a "bog" on O'ahu, and reports on a newly discovered occurrence of this bog type in the central Ko'olau Mountains.

Continued on page 91

Published by the Hawaiian Botanical Society, which was founded in 1924 to "advance the science of botany in all its applications, encourage research in botany in all its phases, promote the welfare of its members and develop the spirit of good fellowship and cooperation among them." Any person interested in the plant life of the Hawaiian Islands is eligible for membership. Information may be obtained from the Society:

c/o Department of Botany
3190 Maile Way
University of Hawai'i
Honolulu, HI 96822

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The Society year is from December 1 through November 30.

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Regular	$7.50
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(UH, Horticulture Department)

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(Bishop Museum)
Art Medeiros
(Haleakala National Park)

Continued from page 89

Annual rainfall at sites supporting ‘Ōhi‘a Montane Bogs is heavy, more than 3,800 millimeters (150 inches); cloud cover and frequent fog are characteristic. Soils are poorly drained acid peats underlain by clay, and often with an impermeable ironstone layer. ‘Ōhi‘a Montane Bogs typically occur as openings in surrounding ‘ōhi‘a wet forest or shrubland. Besides themselves being considered rare and imperilled, many examples include rare plants, often endemics restricted to a particular island, region, and bog habitat.

‘Ōhi‘a bog vegetation ranges from very low-statured (0.1 to 0.5 meters), open, dwarf shrubland to closed shrub thickets, 0.5 to 1.5 meters in height, with the taller shrubs occurring at bog margins. Codominants and associated species vary by location, and there can be a great deal of variability at a single site, depending on topography and influx of elements from adjacent communities. The herb layer is dominated by various sedges, grasses, and mosses, often including one or more species of *Oreobolus*, kuolohia (*Rhynchospora*), *Dichanthelium*, ‘uki (*Machaerina*), and *Racomitrium* (a moss). Several of these species form tussocks that support seedlings of woody plants, various mosses, lichens, and herbs. Some taxa seem strongly restricted to the bog community while others are (often stunted) forms of taxa found in adjacent communities. Epiphytic mosses, liverworts, and ferns are common in the shrub layer. Several rare species are known from ‘ōhi‘a bogs, including certain bog-adapted species of nohoanu (*Geranium*), hōwaiaulu (*Lagenifera*), silversword and greensword (*Argyroxiphium*), kōlea (*Myrsine*), ‘ākia (*Wikstroemia*), na‘ena‘e (*Dubautia*), kamakahala (*Labordia*), and alani (*Melicope*). Some of these are largely restricted to bogs or bog edge vegetation.

Protected examples of Hawaiian bogs are known from the Alaka‘i Wilderness Area (Kaua‘i), The Nature Conservancy’s Kamakou Preserve (Moloka‘i), the West Maui Natural Area Reserve (NAR) and Haleakalā National Park (Maui), and the Pu‘u O ‘Umi NAR (Hawai‘i).

Until a 1993 biological survey conducted by the staff of the Hawai‘i Natural Heritage Program (HINHP) in the Kawailoa Training Area in the Ko‘olau Mountains of O‘ahu (HINHP 1994b), no true montane bog examples were known from O‘ahu. The “bog” often cited informally on the flat summit section of Ka‘ala in the Wai‘anae Mountains is actually a very wet, low-statured woodland of ‘ōhi‘a and lapalapa (*Cheirodendron platyphyllum*) with a dense native shrub and fern understory. Fosberg and Hosaka (1938) reported a bog in the Ko‘olau Mountains; however, the community they described in some detail does not match the current Hawaiian Natural Community Classification (Gagné & Cuddihy, in Wagner et al. 1990) description of a bog. Rather, their “bog” description is consistent with two vegetation types considered characteristic of the Ko‘olau summit crest: an ‘Ōhi‘a Montane Wet Shrubland and a Mixed Fern/Shrub

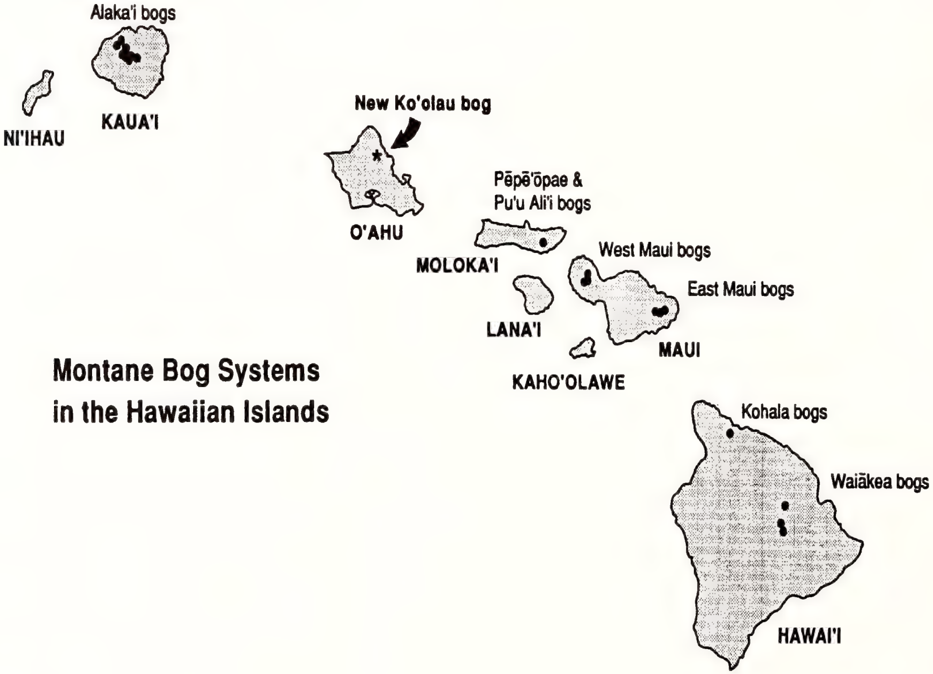
Alaka'i bogs
KAUA'I
NI'IHAU
New Ko'olau bog
O'AHU
Pēpē'ōpae &
Pu'u Ali'i bogs
MOLOKA'I
West Maui bogs
East Maui bogs
LANA'I
MAUI
KAHO'OLAWE
Montane Bog Systems
in the Hawaiian Islands
Kohala bogs
Waiākea bogs
HAWAI'I

Figure 1

Montane Wet Cliff, both of which tend to occupy wind-swept, often steep slopes. The Fosberg-Hosaka "bog" was described as a small area (about 25 m sq) in the cloud zone at the head of Kaipapau and Kawainui Gulches, on a substrate sloped "steeply at an angle of more than 45 degrees" toward the windward precipice. While some Hawaiian bogs may indeed be found on slopes (notably in the West Maui examples), none of them occur on slopes described as steep, or in excess of 45 degrees! Fosberg and Hosaka also noted that their site was "lacking several of the common bog species," and listed constituent species that seemed appropriate for a bog or bog margin. Among these were some highly suggestive taxa such as *Lobelia gaudichaudii* var. *koolauensis*, *Panicum koolauensis*, *Viola oahuensis*, and *Sanicula purpurea*. However, these taxa, and the others described from the Fosberg-Hosaka "bog" are also present (and sometimes prominent) in the wet summit shrublands of the Ko'olaus, themselves very similar in physiognomy and floristics to bogs. Nonetheless, in the decades between 1938 and 1993, the Fosberg-Hosaka "bog" stood as the closest thing to a true Hawaiian bog known from O'ahu.

On March 25, 1993, the HINHP survey team observed a bog about 1.6 kilometers (1 mile) north of the Peahinaia Trail junction along the Ko'olau Summit Trail at about 850 meters (2,800 feet) elevation. The bog was situated on a gentle, south-facing slope of a rounded ridge top to the lee of the summit trail. It occupied the middle slopes of the ridge, on a substrate of water-saturated organic material over weathered clays, in a horizontal ovoid about 2.5 acres extent, with an additional 1 to 2 acres of dense, shrubby bog edge vegetation surrounding it, and extending to ridge top and nearly to gulch bottom. An open-canopied 'ōhi'a wet forest occupied the gulch bottom and the opposite slope of the gulch. Within the bog itself, stature of vegetation was extremely low, ranging from less than 10 centimeters to about 25 centimeters, with very few emergent species such as pu'e (*Lobelia gaudichaudii*) and 'uki (*Machaerina angustifolia*). Surrounding the very low-statured central area was a dense shrub thicket. 0.5 to 1.0 meter tall, that formed a gradual ecotone with ʻŌhiʻa Montane Wet Shrubland on surrounding slopes, and an abrupt transition to open ʻōhiʻa wet forest in the gulch bottom.

A mat-forming lehua makanoe (*Metrosideros polymorpha* var. *pumila*) was common and locally dominant in the bog, while diminutive naʻenaʻe (*Dubautia laxa*) and koʻokoʻolau (*Bidens macrocarpa*) were also common. Other native shrubs included stunted ʻākia (*Wikstroemia oahuensis*), the bog ecotype of pūkiawe (*Styphelia tameiameiae*), puʻe (*Lobelia gaudichaudii*), and ʻōhelo (*Vaccinium reticulatum*). Together, the shrub component comprised about 60 percent of existing cover. Native grasses and sedges made up 25 to 30 percent of the existing cover, and included bog grasses (*Dichanthelium hillebrandianum*, *D. cynodon*, and *Isachne pallens*) and sedges such as *Rhynchospora chinensis*. The discovery of the indigenous sedge *R. chinensis* ssp. *spiciformis* and the endemic grasses *D. hillebrandianum* and *D. cynodon* (which were previously known from bogs and wet sites on Kauaʻi, Molokaʻi, Maui, and Hawaiʻi) constitute new records for the island of Oʻahu. These taxa are among the diagnostic species for Hawaiian bogs, and it is appropriate that the first documentation of these taxa on Oʻahu is in association with their diagnostic bog habitat. Mosses were common among the mats of lehua makanoe and in the spaces between the mats. ʻUki (*Machaerina angustifolia*) was uncommon in the bog itself, but was very common to locally dominant at the bog edge, as is often seen in other Hawaiian bogs (e.g., Pēpēʻōpae and Puʻu Aliʻi bogs on Molokaʻi). Other common constituents of the Koʻolau bog edge included manono (*Hedyotis terminalis*), puʻahanui (*Broussaisia arguta*), ʻākia (*Wikstroemia oahuensis*), naʻenaʻe (*Dubautia laxa*), and other shrub components typical of the Koʻolau summit. Notably, pūkiawe was conspicuously lacking from the bog edge and surrounding shrubland, making its presence in its diminutive form within the bog more striking by contrast.

We saw one rare species, *Viola oahuensis*, in the bog. In addition, the *Lobelia gaudichaudii* in the bog is suspected to be the rare subspecies, *koolauensis*. However, flowering parts need to be examined for confirmation.

Our conclusion that we have documented a true Hawaiian bog in the Koolau Mountains is based on a combination of observations that strongly infer the diagnosis. Three points in particular deserve mention:

1. A distinct combination of diagnostic bog species was present, including *Metrosideros polymorpha* var. *pumila*, the bog ecotype of *Styphelia tameiameiae*, *Lobelia gaudichaudii*, and in particular, the first O‘ahu records of *Rhynchospora chinensis* ssp. *spiciformis*, *Dichanthelium cynodon*, and *Dichanthelium hillebrandianum*.

2. Just as telling, key diagnostic species were *absent* outside of the bog area, notably *Styphelia tameiameiae*, *Metrosideros polymorpha* var. *pumila*, *Rhynchospora chinensis* ssp. *spiciformis*, and *Dichanthelium hillebrandianum*.

3. The community structure and stature was typical of Hawaiian bogs, especially the very low stature (10-25 cm ht) of the vegetation in the central portion of the area, and the manner in which vegetation stature and structure changed toward bog margins.

So, a combination of physiognomy and species composition characters typical of bogs leads us to a claim of some confidence that a true Hawaiian bog has been found in the Ko‘olau Mountains. Luckily, this bog is off of the summit trail, and requires pressing through some very dense shrubland along the ridge that provides access to the site. It is not likely that the casual hiker will notice or attempt to reach the bog, and in the typical mist-bound conditions prevailing in the region, the bog has escaped even the trained eye. O‘ahu botanists, and biologists studying Hawaiian bogs should add this site to the list warranting further study and monitoring. With O‘ahu's chronic alien weed and pig problems, it may be that the Ko‘olau bog, still relatively pristine, will require protective or remedial action in the years to come.

Acknowledgements and Notes

Funding for the Kawailoa Training Area survey that documented the Ko'olau bog was provided by the Department of Defense, Legacy Resource Management Program, Administered by the 25th Infantry Division (Light), Hawai'i. The Hawai'i Natural Heritage Program would like to also thank the many biologists who assisted with the survey.

Because the O'ahu bog is relatively easily accessible from the summit trail, and extremely vulnerable to disturbance, a detailed map of the location of the bog is not included in this article. Such a map is available at the Hawai'i Natural Heritage Program office, but will be restricted in distribution to bog researchers cognizant of the need to conserve such fragile ecosystems.

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Witches' Broom Disease of Mamane (*Sophora chrysophylla*)

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Hawai'i at Mānoa, Honolulu, HI
96822

A disorder of mamane [*Sophora chrysophylla* (Salisb.) Seem.] was first brought to my attention in 1990 when a rancher on land near the Mauna Loa strip of Hawai'i Volcanoes National Park (HAVO) reported to park resource managers that some of his trees appeared to be dying of an unknown cause. Stubby, abnormally thickened twigs were found on branches which he had cut from the declining trees, and during subsequent on-site visits I found major branches of old, mature trees to be affected. Branches were abnormally and irregularly swollen to several times the normal thickness, with stubby, upright twigs clustered to form "witches' brooms." No normally-developed twigs occurred on affected branches of some trees, giving a striking "rosetted" appearance to the entire tree. The disorder was associated with dead or dying tissue, and large portions of affected trees were already dead when observed. Whereas most affected trees were probably scattered remnants of the forest that had since been cleared for pasture, the most severely affected tree was a young mamane about 4 m tall which the rancher had planted near his residence. The tree, which was full of witches' brooms and had little or no normal growth at the time of observation, appeared to have been growing vigorously prior to onset of symptoms, and could not be characterized as weakened, old, or senescent.

Close examination of the twigs of the brooms revealed that the bark tissue was irregularly split due to the abnormal thickening. Dark fruiting bodies of a fungus (pycnidia), grouped in stromal tissue, were readily observed within the bark cracks. The fruiting bodies exuded prominent white spore columns (cirrhi). The spores were relatively large (average 32 x 7 µm), oblong with tapered ends, colorless, and single-celled.

Steven Bergfeld of the Department of Land and Natural Resources Division of Forestry and Wildlife later accompanied me to a site on the upper Kona highway (190), just south of its intersection with the Saddle road, where scattered, mature mamane in a dry, open forest mauka of the highway were similarly affected with occasional large brooms and swollen branches on dead portions of the trees. However, the disease did not appear to be active at the Kona site as no fresh symptoms were observed either during the initial visit or during a subsequent visit in 1993.

Recently, (August, 1994) I revisited the ranchland site adjoining HAVO. The young tree with severe symptoms described above had died and had been removed by the land owner. An older tree in the area which was heavily laden with brooms had also died, and other older trees contained many dead major branches associated with brooming, galling, swelling, and contortion. Whereas the mamane symptoms to my knowledge have not yet been observed within HAVO, a newly discovered diseased tree which was mostly dead but with some live, freshly broomed twigs was found near the Highway 11 boundary of the park, mauka of the Footprints area. The presence of diseased trees in the park therefore would not be surprising.

At present, the cause of the symptoms has not been confirmed experimentally. However, the fungus associated with the disease agrees with the description of *Sphaeropsis tumefaciens* Hedges, a pathogen which causes branch galls, witches' brooms, and twig swelling on various woody plants, including citrus, Natal plum, and bottlebrush in Florida and the Caribbean region (Holliday and Punithalingam, 1970; Sinclair *et al.*, 1987). It may be of particular interest that galling and witches' broom formation associated with this fungus has also been reported on Brazilian pepper-tree *(Schinus terebinthifolius* Raddi) in Florida, where the host is considered a noxious weed (Marlatt and Ridings, 1979). This tree is known as Christmas berry in Hawai‘i, where it is also considered a serious weed, but *S. tumefaciens* has not been reported on Christmas berry in Hawai'i. The only previous record of *S. tumefaciens* in Hawai'i appears to be an uncertain report of this fungus on *Citrus* sp. recorded by the United States Department of Agriculture in 1960 (Raabe *et al.*, 1981; USDA-ARS, 1960).

In 1991 Jack Jeffrey of the Hakalau Forest Reserve, U. S. Fish and Wildlife Service, called my attention to an extensive population decline of mamane in the palila habitat of Pu'u Ahumoa and Pu'u La'au on the upper slopes of Mauna Kea. In 1993 Brion Duffy, a research associate in my program who carried out preliminary investigations of the decline, conducted island-wide surveys of mamane populations to determine if decline was limited to the Mauna Kea site (Duffy and Gardner, 1993). He observed extensive rat damage to bark of mamane in the Ka'u Desert area of HAVO near makai of Highway 11, but also noted that rat damage could not account for the extent of dieback or decline observed on about 36% of the unhealthy trees surveyed. Whereas another type of fungal canker was found on some of these trees, there was no indication of the growth abnormalities such as the brooming, galling, and branch thickening and contortion associated with *S. tumefaciens* on the declining trees described above. Likewise, none of these symptoms have yet been associated with the decline on Mauna Kea. The thinning of the mamane stand in palila habitat therefore may be unrelated to the observed symptoms elsewhere and remains an open subject of investigation.

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Notes for the Hawaiian Botanical Society

May 2nd

President Keeley called the May 2nd meeting to order at 7:35 p.m.

The minutes of April were read and accepted.

The treasurer's report was read and accepted.

The Science Fair Committee gave a report of the awards.

New Business

President Keeley urged members to participate in planning a field trip to a Nature Conservancy Preserve for this Fall

Ted Green gave a show-and-tell of some interesting hoya's.

Vice-president Lisa Stratton introduced the plant of the month speaker, Mr. Timothy Motley of the botany department at UH. He spoke on the rare, endangered, and extinct species of *Isodendrion*, and endemic Hawaiian genus in the violet family.

Dr. Charles Lamoureux, director of the Lyon Arboretum, was introduced as the speaker of the month. He spoke on forest conservation in

Indonesia. He described the climate and topography, the native animals, and the high species diversity of flowering plants. He also illustrated conservation efforts through reforestation, and revegetation projects in the public and private sectors.

Late Announcements

Sy Sohmer of the Philippines flora project gave an announcement of a Philippines Flora workshop in the Philippines and funds for a graduate student in taxonomy to participate in the workshop.

Loyal Mehrhoff announced a botanist position for Pohakuloa Training Area.

Meeting was adjourned at 8:45 p.m. and refreshments were served.

Science Fair Awards

Awards from the Hawaiian Botanical Society

1st place senior division

Haili Camarillo, Matt Gabriel, Daniel Kauwe for *Prevalence of Avian Malaria in ‘Apapane (*Himatione sanguinea*) at upper elevations*

2nd place senior division

Layne Richards for *The medicinal efficacy and chemical properties on ‘ie‘ie (*Freycinetia arborea *Gaud.): Culture & Science (A two-year study)*

1st place junior division

Jeffrey Kurasaki for *Antibacterial properties of Noni*

2nd place junior division

Jessica Countess for *A population study of Myrica Fava (Aiton) and ‘Ōhi‘a Lehua*

Benton Keali‘i Pang, and Winona P. Char were judges. Char and Associates donated $90 to the Society for prizes and t-shirts (total $150 value).

September 12

President Keeley called the September 12th meeting to order at 7:35 p.m.

The minutes of May were read and accepted.

The treasurer’s report was read and accepted.

Membership Committee proposed 4 new members:

Chrissen Gemmel, Jesicca Countess, Frans Mollemans, and Robert Anderson.

All were accepted into the Society.

New Business

Editor Greg Koob announced the upcoming release of the Special Newsletter and the $3.00 donation the board is asking of all the members to cover publication costs.

An executive Board and Officers are needed for 1995.

Peter Schyler, manager for the Natural Areas Reserve, was introduced as the plant of the month speaker. His talk was on the Natural History of the Santa Cruz Islands off the coast of California. He showed slides illustrating the geology, plant communities, animals, island endemics, human history, and conservation management of this unique coastal island.

Refreshments were served after the meeting.

October 2nd

President Keeley called the October 2nd meeting to order at 7:30 p.m.

The minutes of September were read and accepted.

Not treasurer's report this month.

New Business

The Board elected Greg Koob, Benton Pang, and Lisa Stratton as the nominating committee for officers.

Editor Greg Koob again urged all members to contribute $3.00 for the special newsletter which they received, using the order form in the back of the newsletter.

Plant of the month speaker was Joel Lau of the Hawai‘i Natural Heritage Program at the Nature Conservancy of Hawai‘i. He showed slides of three rare ferns of the Ko‘olau and their interesting stream-side habitats. The ferns were *Doodia lyonii*, *Christella boydii*, and *Pteris lydgatei* and were recently discovered by Joel while on surveys for the Hawai‘i Natural Heritage Program.

Michael Buck, director of the

Division of Forestry and Wildlife was introduced as the main speaker. His talk was on the proposed rule changes in the State Endangered Species Law. After discussing the priorities of the Division, he gave the content of the changes which were to encourage horticultural propagation to save endangered species. He also discussed the three types of permits that would be allowed under the new rules.

There was plenty of discussion about the new changes and their impacts on endangered species and habitats.

Refreshments were served afterwards.

Annual Report of the Membership Chairman

As of the close of the Society Year, November 30, 1994, there were 158 individual or institutional members.

There were:

25 Life members

7 Honarary members

61 Regular members

24 Student members

21 Family members

12 Paid Institutional members

8 Echange or gratis distributions

Considering gains and losses, there has been little change in the total number of members for some few years, but the present size contrasts unfavorably with the more-than-300 members of years ago. All members are urged to encourage their acquaintances and associates who have an interest in Hawaiian or Pacific botany to join the Society.

Donal P. Gowing

NEWSLETTER OF THE HAWAIIAN BOTANICAL SOCIETY
C/O DEPARTMENT OF BOTANY
UNIVERSITY OF HAWAI'I AT MĀNOA
3190 MAILE WAY
HONOLULU, HI 96822

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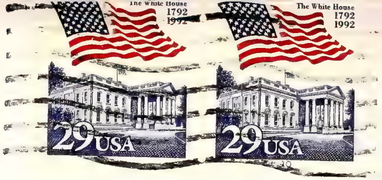
19 JAN
1995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